GRADE INFLATION AT THE UNIVERSITY OF HAWAII- MANOA

by

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I. Introduction

Overall grade inflation and varying rates of grade inflation between departments are considered to be a nationwide phenomenon. The February 18, 1998 issue of *The New York Times* reports that 83 percent of the grades given at Princeton given between 1992 and 1997 fell between A+ and B-, compared to 69 percent between 1973 and 1977. According to the March 31, 1995 issue of *The Yale Daily News*, “In fact, at Yale pretty much all grades of C or below are long gone. Thanks to the grade inflation of the past thirty years, 80 percent of the grades given at Yale are now As or Bs…Grade inflation is not bad in itself – as long as it is real. If students do their work, they should be rewarded with the grades that they deserve.” The debate surrounding this phenomenon is also well illustrated by the mid-term removal of a chemistry instructor at the University of Montana in 1995 because he was "too tough" [1] and the removal of the Chancellor of the City University of New York, who faced allegations including not controlling grade inflation. [2]

More often than not, the term grade inflation is used to imply a decline in grade standards. Grade inflation may not only adversely affect the academic accountability and comparability of grades within and across universities but, perhaps more importantly, may obscure the role of grades as a signal for students' academic ability, thereby leading them to make biased selections on courses and majors. Grade inflation and related issues, such as teaching evaluations and teachers' performances, [3] have concerned many educators and school administrators, and numerous empirical studies have merged. Although the annual MAPS report provides a few summary statistics for every Fall

[1] See Crumbley (1997).
[2] See Sarel (1998).
[3] See, for example, Nelson and Lynch (1983), Schmelkin, Spencer and Gellman (1997) and Zangenehzadeh (1988) for discussion on grade inflation and teaching evaluations.

semester, no rigorous investigation has been done for the University of Hawaii, and this is the void that this study attempts to fill.

As such, this study aims to closely examine the trends in grade distribution from various perspectives and provide useful groundwork for future studies on related issues. Using statistical and econometric methods, I will first analyze the trends in enrollment, grade distribution and mean grades for different course levels. I will then examine the differences in grade trends between male and female students. Lastly, the grade gaps between high-grading and low-grading departments will be considered.

II. Data

I used data on all grades given by all departments and programs in the Arts and Sciences Colleges at the University of Hawaii at Manoa, the flagship campus in the state university system, for a period of 25 semesters between the 1987 and 1999 Spring semesters. The colleges include over 40 departments and account for about two thirds of the total undergraduate enrollment.

III. Analysis

1. Course Levels and Grade Inflation

In this section, I analyze trends in course enrollments [4] and grades for different categories of course levels. First, all course offerings (All Levels) are divided into undergraduate and graduate courses (Undergraduate and Graduate Levels, respectively), and Undergraduate Level is then divided into Lower Division (100 and 200 level courses - mostly pre-major courses) and Upper Division (300 and

[4] In this study, the term enrollment refers to the number of students with course grades other than Is (Incomplete) and Ws (Withdrawal).

400 level courses). I also grouped the courses with any number of writing intensive sections as an additional category of Writing Intensive.

Enrollment statistics show different patterns for different categories. The total enrollment for Undergraduate had been on a steadily rising trend before it began to decrease in the academic year 1996-1997 because of a tuition increase of 50% in the same year as well as the continuously lagging state economy. The enrollment in Writing Intensive shows basically the same pattern; however, enrollment in Graduate has been almost flat over the sample period.

Undergraduate enrollment fluctuates between fall and spring semesters. Figure 1 demonstrates that Lower Division is responsible for this fluctuating pattern. Unlike Lower Division, enrollments in Upper Division, Graduate and Writing Intensive do not show any obvious differences between Fall and Spring semesters.

To check for the existence of grade inflation, I traced the trends in both grade distribution and mean grades. First, Figures 2–7 show the evolution of percentage shares of all letter grades for All Levels, Undergraduate, Lower Division, Upper Division, Graduate and Writing Intensive, respectively. In each figure, it is clear that the share of As has been increasing while that of Cs has been decreasing. Interestingly, the share of As had been larger in Spring semesters than in Fall semesters until Spring 1996 whereas the share of Cs had been larger in Fall semesters than Spring semesters during the same period. This pattern is more obvious in Undergraduate and Upper Division.

However, these observations alone do not allow us to assert that mean grade has been rising since the share of Bs has been shrinking in all categories except Writing Intensive. The percentage share of As and Bs in Writing Intensive has been steadily increasing while that of Cs, Ds and Fs has been decreasing, and As and Bs accounted for about 80 percent of all grades in Spring 1999, showing

10 percent increase from Spring 1988. [5] In contrast, the share of As and Bs in all other categories commonly shows an increase of about 6 percent. In spring 1999, the share was about 73 percent in All Levels, 72 percent in Undergraduate, 68 percent in Lower Division and 80 percent in Upper Division. These numbers seem significantly smaller than those for mainland schools such as previously noted Princeton and Yale.

Overall grade inflation is clearly evidenced by trends in mean grades. Figure 8 demonstrates that mean grades have increased in all categories over the sample period. The figure also shows that the mean grade in Upper Division rose above the B level in 1990 while those in Lower Division and Undergraduate remained under B. In contrast, the mean grade in Writing Intensive rose above B in the mid-1990s.

During the sample period of 25 semesters, the mean grades in Undergraduate, Lower Division and Upper Division have risen by 0.15 from 2.81 to 2.96 (on a 4-point scale), by 0.14 from 2.71 to 2.85, by 0.19 from 3.02 to 3.21, respectively. Although there are no directly applicable standards, at least two frequently cited studies on grade inflation provide some numbers to compare. Kolevzon (1981) reports that the mean grade of junior- and senior-level students majoring in twenty departments at an anonymous university had risen by 0.30 over a mere seven year period from 1969-1970 to 1975-1976. It seems, therefore, the grade inflation in the upper division courses at the University of Hawaii has been considerably low. The grade inflation in the lower division course seems to have been relatively low, too, when compared to Sabot and Wakeman-Linn's (1991) result that the mean grade in the introductory courses of eight large departments at Williams College had risen by 0.44 between 1962-1963 and 1985-1986. Put differently, the University of Hawaii has certainly experienced grade inflation but at a relatively low rate.

[5] This is the first semester with data for the writing intensive courses.

I also examine trends in mean grades using regression analysis. The time series of mean grades for each category is regressed on two variables: Trend and Spring. The variable Trend is generated in order to consider a linear trend in regression, and it is set at 1 for Spring 1987 and 25 for Spring 1999. The variable Spring is a dummy variable for Spring semesters. Tables 1–6 respectively summarize the regression results for all categories. [6] As seen in the tables, the coefficient of the variable Trend is statistically significant and has a positive sign for each course level category, thereby confirming the ubiquitous trends of increasing mean grades. The coefficient of the variable Spring is also statistically significant and has a positive sign for all categories except Writing Intensive. Since enrollments are much lower in spring semesters, one may speculate that the variable Spring may capture the effect of lower enrollments on mean grades in spring semester. However, it turns out to be untrue since the explanatory power of enrollments as a regressor for mean grades is statistically negligible in other regressions run separately for all categories. No matter what may cause it, this "Spring effect" - the phenomenon of higher grades in Spring semesters - is certainly an intriguing finding.

An even more interesting observation about the Spring effect is that it has become less visible since Fall 1996, as shown in Figure 8. The figure shows that the fluctuation of mean grades between Fall and Spring semesters almost disappeared for Undergraduate in the same semester in which the enrollment for Undergraduate took a downturn. It might be merely a coincidence, but one may hypothesize that students became more cost-conscious and began to take up the "Fall slack" by working hard consistently throughout the year.

[6] In all regressions except the one for Upper Division, the null hypothesis of no serial correlation is not rejected on the basis of the Durbin-Watson statistic while the statistic computed for the Upper Division regression indicates a positive serial correlation.

2. Genders and Grade Trends

It is often said that female students perform differently in terms of mean grades than male students, and this section discusses whether it is true for each of the categories: All Levels, Undergraduate, Lower Division, Upper Division, Graduate or Writing Intensive. [7]

First, Figure 9 shows that the gender composition in terms of percentage of male students has not changed much for the categories of Undergraduate, Lower Division and Upper Division. The figure also shows that, although fluctuating without a noticeable pattern, female percentage in Writing Intensive has been generally higher than that in any other undergraduate categories. What does not fail to catch our attention is the gender composition in Graduate. From about 46 percent in Spring 1987 to about 58 percent in Spring 1999, the female percentage in graduate courses has sharply increased, passing the 50 percent mark in the academic year 1994-1995.

Despite different trends in undergraduate and graduate enrollments, female students have obtained higher mean grades than male students in every single category, as shown in Figures 10–15. In particular, Figure 11 shows that the mean grade of female undergraduate students has been rising throughout the sample period and has been continuously above the B level since the mid-1990s. In contrast, the mean grade of male undergraduate students stopped rising in the mid-1990s, and has remained under B through the entire time period. In addition, a comparison of Figures 12 and 13 further reveals that it is the grades in Lower Division that dampened the increasing trend in undergraduate male grades. The mean grade of male students from Upper Division has continued to increase, and has been above B in the most recent semesters.

[7] The next section will include discussion of gender differences in mean grades for selected departments.

The time series of male and female mean grades are analyzed together using the Seemingly Unrelated Regression Estimation (SURE) method. The idea of using the SURE method is that the grading policies for male and female students may not be independent and thus the true regression equations for male and female grades might be interdependent. If it is true, then the SURE method will produce more statistically meaningful results than the separate regressions of female and male series. If not, the SURE method will produce the same results as the separate regressions. Tables 7–12 summarize the regression results for all categories. According to the Breusch-Pagan statistics reported in the tables, the null hypothesis of independence between male and female grade equations is accepted for All Levels, Undergraduate, Lower Division, and Graduate categories. In other words, male and female grades from Upper Division or Writing Intensive share common factors other than Trend and Spring, the variables specified in the regression.

The regression results confirm the existence of the Spring effect in the gender-specific grade trends for all categories except the male grades from Lower Division and Graduate and both male and female grades from Writing Intensive. It is, therefore, concluded that overall the Spring effect is stronger for female students. One might even further speculate that this gender difference might contribute to the generally higher grades of female students; however, it is not true since the variable Spring is found to be insignificant in other regressions separately done for grade discrepancies between male and female students.

Grade inflation is found in both genders. As seen in Tables 7–12, the SURE regressions obtain statistically significant and positive coefficients of the variable Trend for all categories.

Given the existence of grade gap between genders, a natural follow-up question is whether the gap is widening or not. Figure 16 shows the evolution of gender gap for all categories. The figure does not provide a manifest answer to the

question although it at least shows that the gaps are wider in recent semesters than in earlier semesters. It also shows that the gender gap for Undergraduate has moved more closely with that for Lower Division than Upper Division.

The SURE regression results presented in Tables 7–12 provide a lucid answer to the question. In the regressions for all categories, both the constant term and coefficient of Trend variable are bigger in the female grade equation than in the male grade equation. [8] In other words, the female grade trend has a bigger intercept and steeper slope than the male grade trend, clearly implying that the gender gap is widening.

3. High Grading and Low Grading Departments

One of the common observations regarding grade trends in many universities is that grade inflation has led to a widening gap between low-grading and high-grading departments. This phenomenon has reduced the credibility of grades as a signal of students' academic strengths, not to mention enrollment changes across departments. This section discusses the experience of the University of Hawaii in this regard, on the basis of close examination of eight selected departments on the Manoa campus.

In previous studies, the departments of Chemistry, Economics and Mathematics are often considered low-grading while the departments of Art, English, Political Science are considered high-grading. [9] To decide low-grading and high-grading departments, I first computed mean undergraduate grades for all individual

[8] According to the Durbin-Watson test done separately for the male and female equations, the null hypothesis of no serial correlation is not rejected for either equation in the regressions for the categories of All Levels, Undergraduate, Lower Division and Graduate. While the null hypothesis is not rejected for the male equation, the female equation shows a definite positive correlation in the regression for Upper Division. In contrast, the null hypothesis is accepted for the female equation but the male equation shows a definite positive serial correlation in the regression for Writing Intensive.

departments with annual undergraduate enrollments over 1000 for each academic year in the sample period. The result shows a wide spectrum of mean grades across departments, ranging from 2.01 for Mathematics to 3.34 for Drama in 1987–1988 and ranging from 2.10 for Mathematics to 3.48 for Music in 1998-1999. [10] Among these departments, the three lowest-grading departments were Mathematics (MATH), Economics (ECON; mean grade=2.41) and Information and Computer Sciences (ICS; mean grade=2.45) in 1987–1988, and Math, Chemistry (CHEM; mean grade=2.46) and ECON (mean grade=2.52) in 1998–1999. The highest-grading departments were Drama (THEA), Music (MUS; mean grade=3.32) and Speech (SPCH; mean grade=3.08) in 1987–1988, and MUS, THEA (mean grade=3.40) and Communication (COMM; mean grade=3.36) in 1998–1999. On the basis of these rankings, I group MATH, ECON, ICS and CHEM as low-grading and SPCH, THEA, MUS and COMM as high-grading.

First of all, Figures 17–18 present the enrollment trends for the eight selected departments over the sample period. The most notable and interesting in those figures are ICS and SPCH. In Figure 17, ICS is the only department that is free from the overall decreasing trend in enrollments in recent semesters, and it has instead seen the enrollment figure doubled during the sample period. This observation is made in the context of the department emerging as a mid-ranking department in terms of mean grades in 1998–1999 [11] while it was the third lowest-grading in 1987–1988. [12] In contrast, SPCH in Figure 18 shows a sharply decreasing trend in enrollment while other departments show increasing or modestly decreasing trends. This occurred while SPCH, which was the third highest-grading department in 1987–1988, became rather low-grading in 1998 -

[9] See, for example, Sabot and Wakeman-Linn (1991).
[10] The departments of Drama and Dance merged into a single department of Theatre and Dance later. In 1987–1988, the mean grade in Dance was 3.27.
[11] In 1998–1999, the mean grade in ICS was 2.95, which happened to be almost identical to the overall undergraduate mean of 2.96 in that year.
[12] Rankings in terms of mean grades are made among the departments with undergraduate enrollments being higher than 1000 during the academic year in consideration.

1999. The mean grade in SPCH in that year was 2.87 while the overall undergraduate mean was 2.96.

Although these observations seem to suggest a strong positive correlation between mean grades and enrollments, the same figure also provides a potential counter-example. COMM, which emerged as the third highest-grading department later in 1998 –1999, was in the middle of the mean grade rankings in 1987–1988, with the mean grade being 2.90, which was almost equal to the overall undergraduate mean of 2.91 in the same year. In addition, Figures 33-34 demonstrate the undeniable existence of grade inflation both in terms of grade distribution and mean grade. Nevertheless, Figure 18 manifests that the enrollment has dropped substantially. Given the on-going process of merging COMM and Journalism, one supporting the positive correlation might want to attribute the enrollment drop to the enrollment shift from COMM to Journalism, which is, arguably, "the closest substitute." However, Journalism has also experienced a modest drop in enrollments although its mean grade ranking and mean grade itself have changed little over the same period. As a matter of course, one needs more information to explain this seemingly puzzling observation. Meanwhile, the case of COMM seems to make it at least difficult to accept the role of grades as an incentive for enrollments. [13]

Figures 19–34 present the trends in grade distribution and mean grade for all students, male students and female students for each of eight selected departments. The figures suggest that some departments have experienced grade inflation while some others have experienced grade deflation.

[13] Given the existence of grade inflation and overall enrollment decrease, some departments must see an enrollment drop while others may see an enrollment increase. In this sense, a rigorous study on the relationship between grades and enrollments using time series data must employ an econometric method that can isolate such aggregate effects. It is, however, beyond the scope of this study.

First, MATH does not show any clear sign of either grade inflation or grade deflation. Although the percentage share of As has increased substantially, percentage of Fs has also substantially increased, leaving the mean grade little changed. Interestingly, the mean grade sharply dropped during the mid-1990s, which happens to be the same period during which ICS experienced a high rate of grade inflation and became a mid-ranking department in terms of mean grade. The result of the regression analysis on mean grades is consistent with the non-existence of any visible grade trend as the coefficients of both Trend and Spring turn out to be statistically insignificant. [14] In comparison, ECON shows a modest rate of grade inflation; the percentage share of As and Bs has increased while that of Cs, Ds and Fs has decreased, and the mean grade increased from 2.30 to 2.59 over the sample period. However, the regression result for ECON does not support the existence of the Spring effect while the coefficient of Trend is positive and statistically significant. ICS shows an even more interesting pattern. Figures 23 and 24 clearly demonstrate a high rate of grade inflation followed by a high rate of grade deflation in the late 1990s. In contrast, CHEM shows modest grade deflation throughout the sample period. The coefficients of both Trend and Spring are statistically significant and negative for the CHEM regression.

All high-grading departments except SPCH show varying rates of grade inflation: a modest rate for THEA and MUS and a high rate for COMM. In all regressions, the coefficient of Trend is positive and statistically significant while the coefficient of Spring is statistically insignificant. As for SPCH, Figures 27 and 28 show that the percentage share of As and Bs has decreased while that of Cs and Ds has increased, thereby lowering the mean grade over the sample period. In the regression result, the coefficient of Trend is negative and statistically significant while the coefficient of Spring is positive but statistically insignificant.

[14] The regression results for individual departments are not reported here but available from the author upon request.

The comparison in terms of the magnitude of the estimated slope of Trend does not provide clear indication of a widening gap between high-grading and low-grading departments, which has caused concern in many other universities. In fact, the results are mixed since ECON (the second-lowest grading department in 1987-1988 and third-lowest in 1998-1999) has a steeper slope than THEA and MUS (the first two highest in both years) while MATH (the lowest in both years) has a zero slope. In addition, COMM (mid-ranking in 1987-1988 but the third-highest in 1998-1999) has a steeper slope than ECON while SPCH (the third-highest in 1987-1988 but a mid-ranking in 1998-1999) has a negative slope. At the same time, the standard deviation of the eight mean grades is slightly lower in Spring 1999 than in Spring 1987. In sum, the tendency of a widening gap between departments is inconclusive in this study while there is clear evidence of varying rates of grade inflation (deflation) between departments.

For each selected department, the mean grade of female students is significantly higher than that of male students in almost all semesters in the sample period. This result thus seems to falsify a hypothesis that female students better perform only in certain subjects. Instead, it is found in this study that, on average, female students receive higher grades than male students not only at the aggregate levels of Upper Division and Lower Division but also at individual department levels.

It is also noted that the Spring effect is not present or insignificant in regression analysis for all selected departments except CHEM. The Spring effect is significant but negative for CHEM. These results are then in sharp contrast with the significant (positive) magnitude of the effect at the aggregate levels. Given that all eight departments were chosen at the tails of mean grade distribution, it is presumed that the Spring effect must be most prominent for mid-ranking departments.

IV. Summary

I found in this study that, in all five course categories of All Levels, Undergraduate, Lower Division, Upper Division, Graduate and Writing Intensive, the University of Hawaii has experienced a modest rate of grade inflation over the past twelve years, both in terms of the distribution of grades and the mean grade. However, the rates of inflation have been considerably lower than those found for other universities in previous studies.

Although selected departments have shown different enrollment and grade distribution trends, I could not find clear evidence of the widening gap between low-grading and high-grading departments, the phenomenon said to accompany grade inflation in many universities.

Interestingly, female students have earned higher mean grades than male students in all five categories in all semesters, and this gender discrepancy seems to be widening. Even at an individual department level, the mean grades of female students are almost always higher than those of male students. It is also found that students have earned higher mean grades in Spring semesters than Fall semesters, and this Spring effect is more obvious among female students. However, this Spring effect seems to have disappeared since the tuition hike in 1996.

A number of interesting issues are considered in this study, and I hope this study will stir up discussion around campus. The larger contribution of this study is yet to come out of further consideration of grading policy, teaching evaluations, enrollments and other related issues.

V. References

Larry Crumbley, "Students Evaluations and Grade Inflation," *The Touchstone*, November 1997.

Michael S. Kolevzon, "Grade Inflation in Higher Education: A comparative Study," *Research in Higher Education*, Vol.15 No.3 (1981), pp.195-212.

Jon P. Nelson and Kathleen A. Lynch, "Grade Inflation, Real Income, Simultaneity, and Teaching Evaluations," *Journal of Economic Education*, Winter 1984, pp.21-37.

The New York Times, “Just because the Grades are up, Are Princeton Students Smarter?” February 18, 1998.

Richard Sabot and John Wakeman-Linn, “Grade Inflation and Course Choice,” *Journal of Economic Perspectives*, Vol. 5 No. 1 (Winter 1991), pp.159-170.

Dan Sarel, "Grade Inflation and Corporatism (U.S.)," October 17, 1998, (http://complit.rutgers.edu/palinurus).

Liora Pedhazur Schmelkin, Karin J. Spencer and Estelle S. Gellman, "Faculty Perspectives on Course and Teacher Evaluations*," Research in Higher Education*, Vol.38 No.5 (1977), pp.575-592.

Robert C. Scott, "A Comment on Grade Inflation: A Way Out," *Journal of Economic Education*, Summer 1988, pp.227-229.

The Yale Daily News, “Grade Inflation Works: Yalies work hard and merit good marks,” March 31, 1995.

Hamid Zangenehzadeh, "Grade Inflation: A Way Out," *Journal of Economic Education*, Summer 1988, pp.217-226.

Figure 1. Enrollments for All Categories

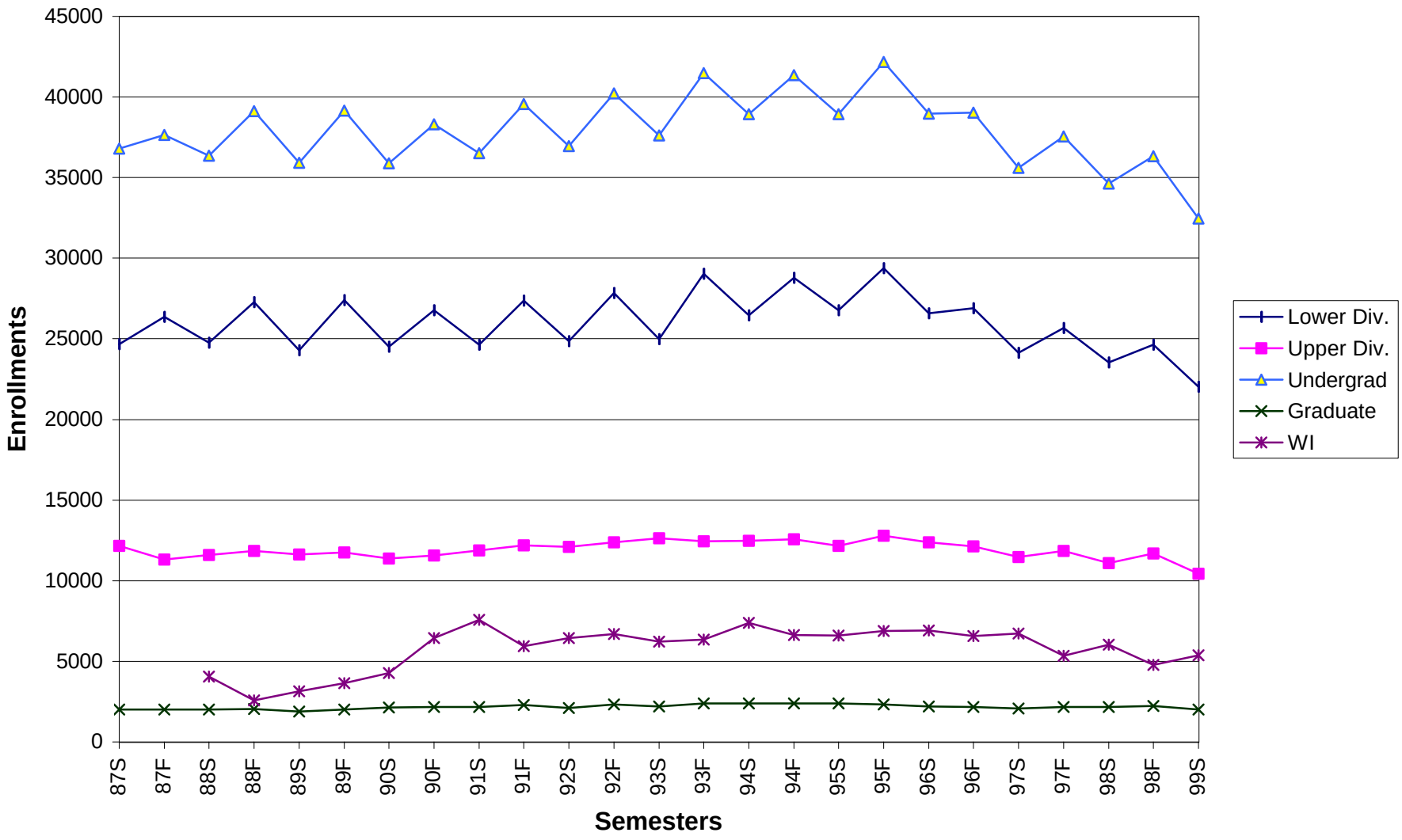

Figure 2. Grade Distribution: All Levels

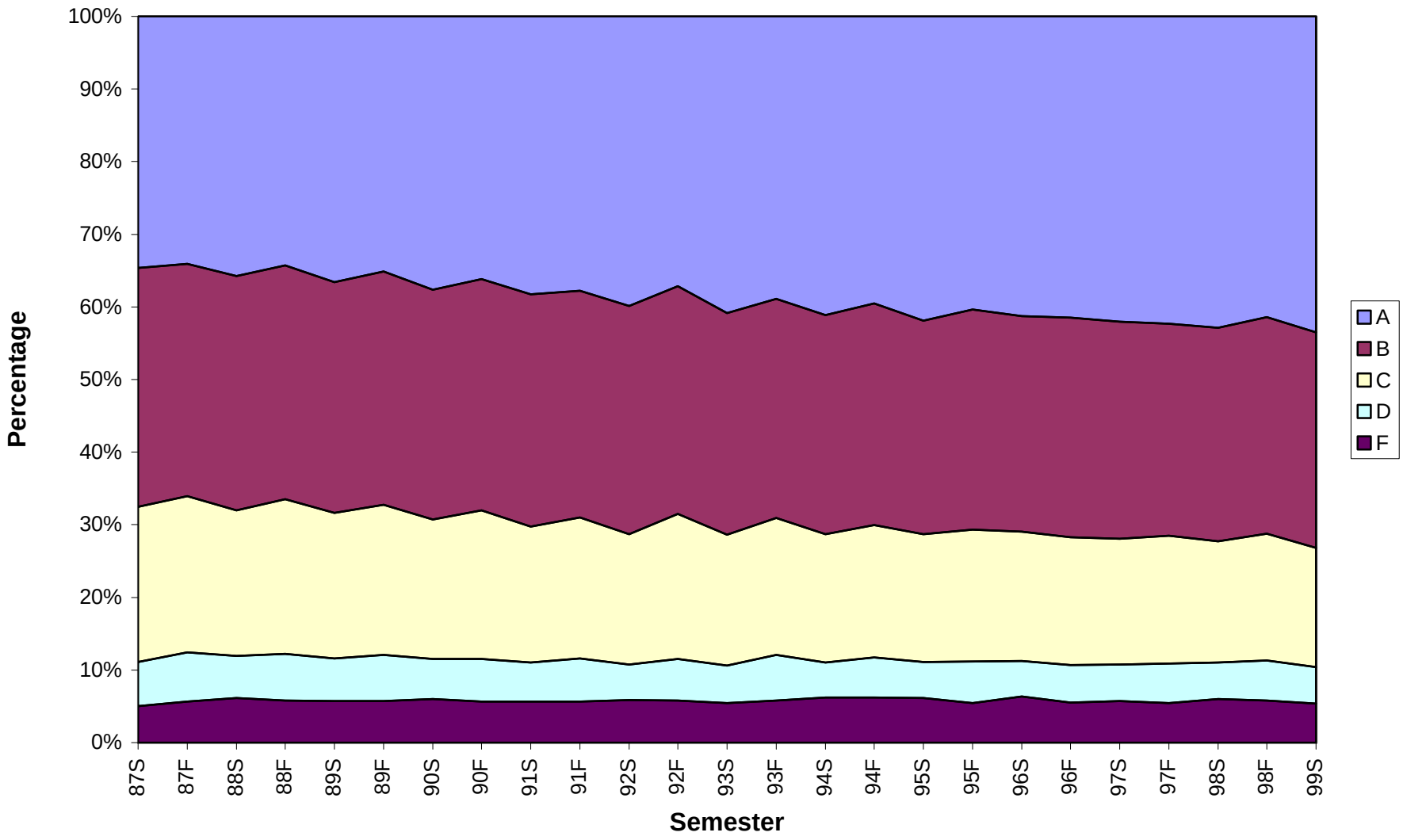

Figure 3. Grade Distribution: Undergraduate

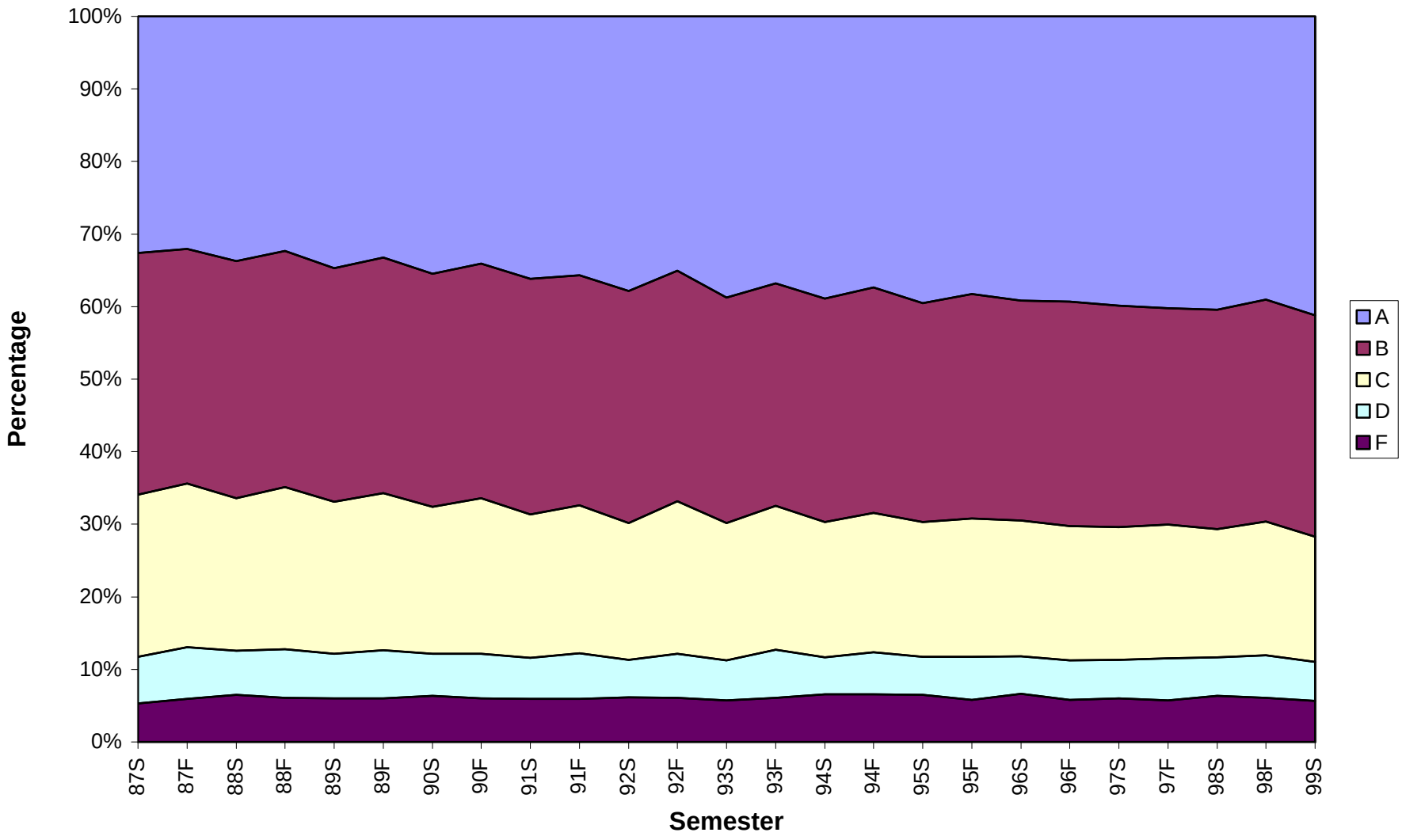

Figure 4. Grade Distribution: Lower Division

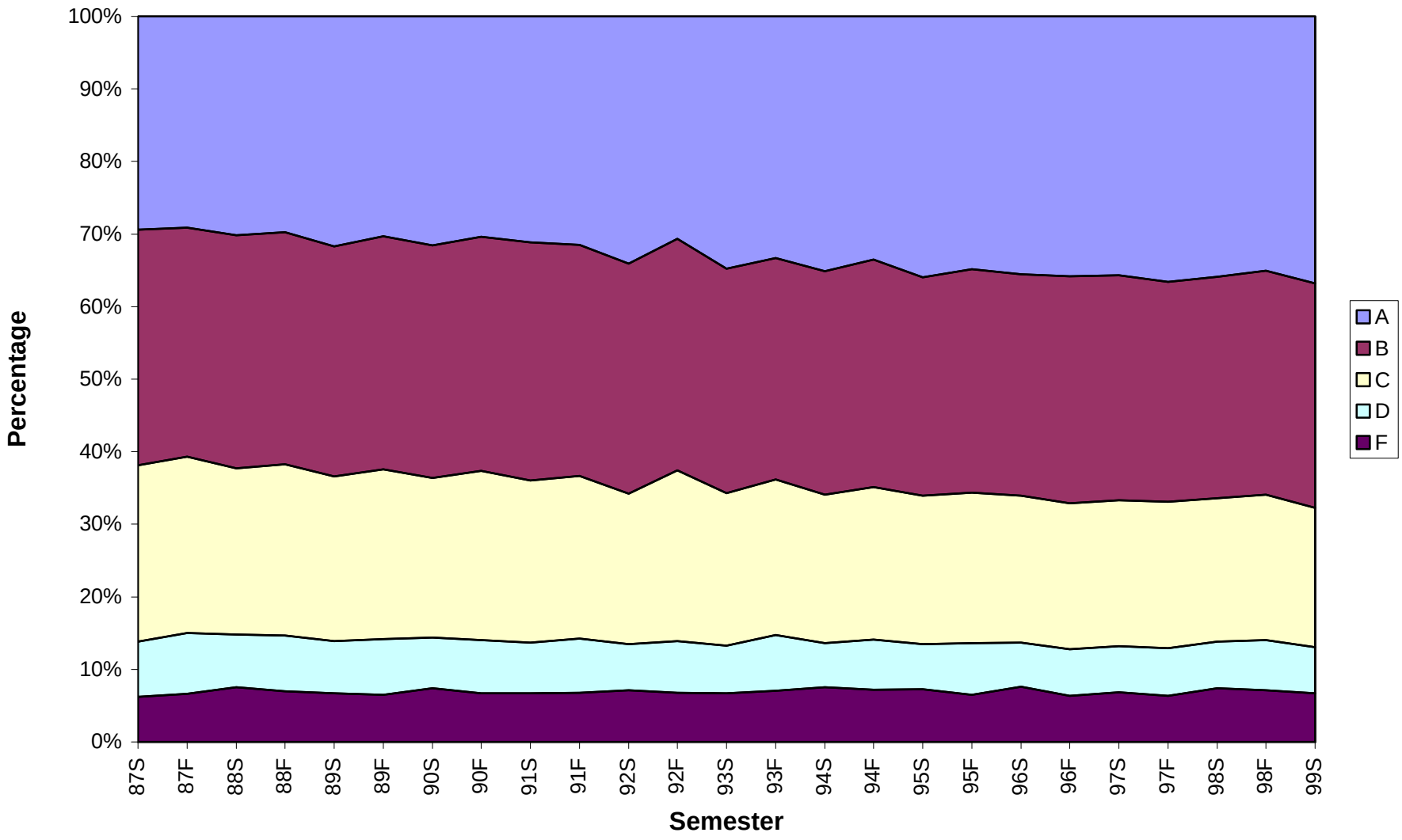

Figure 5. Grade Distribution: Upper Division

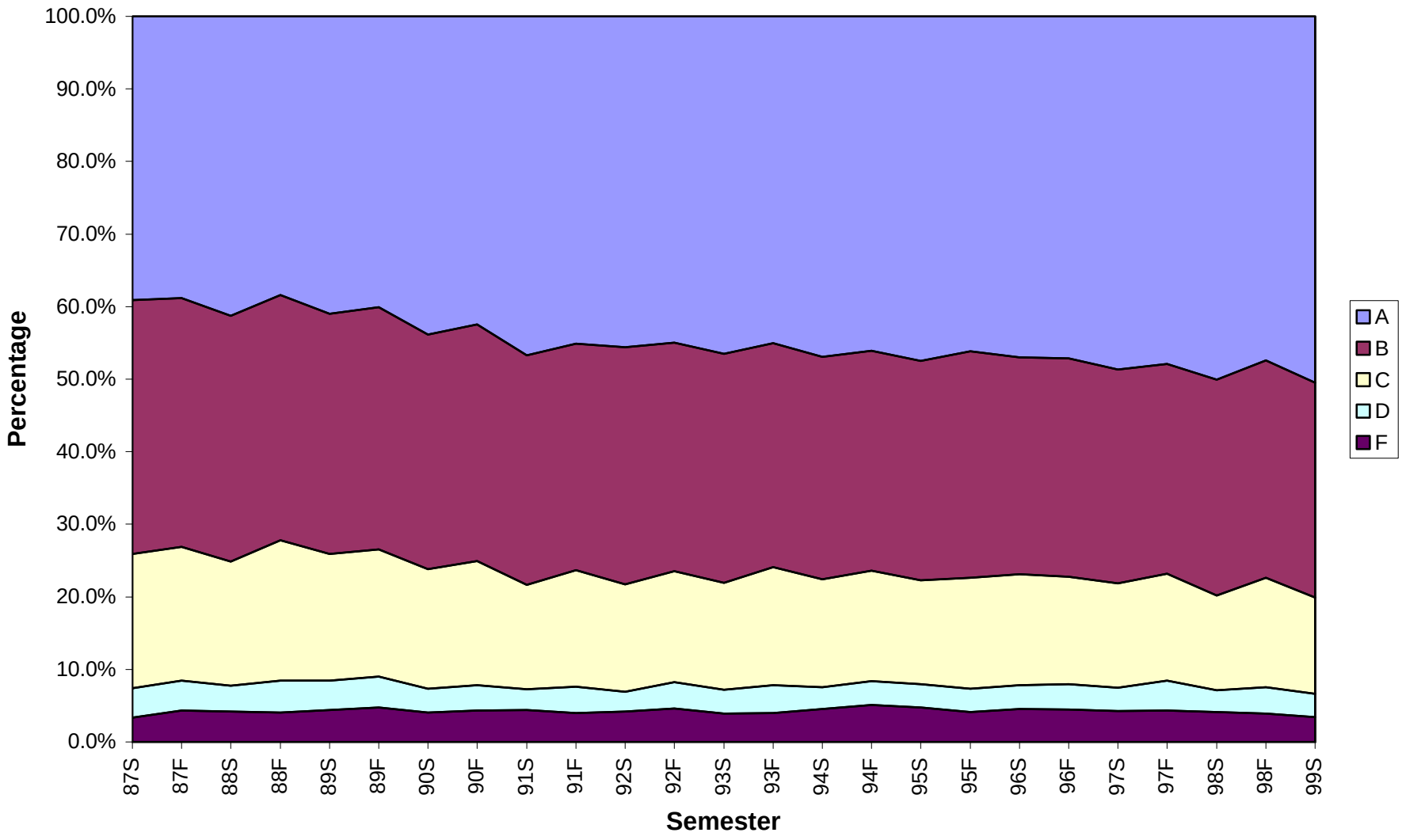

Figure 6. Grade Distribution: Graduate

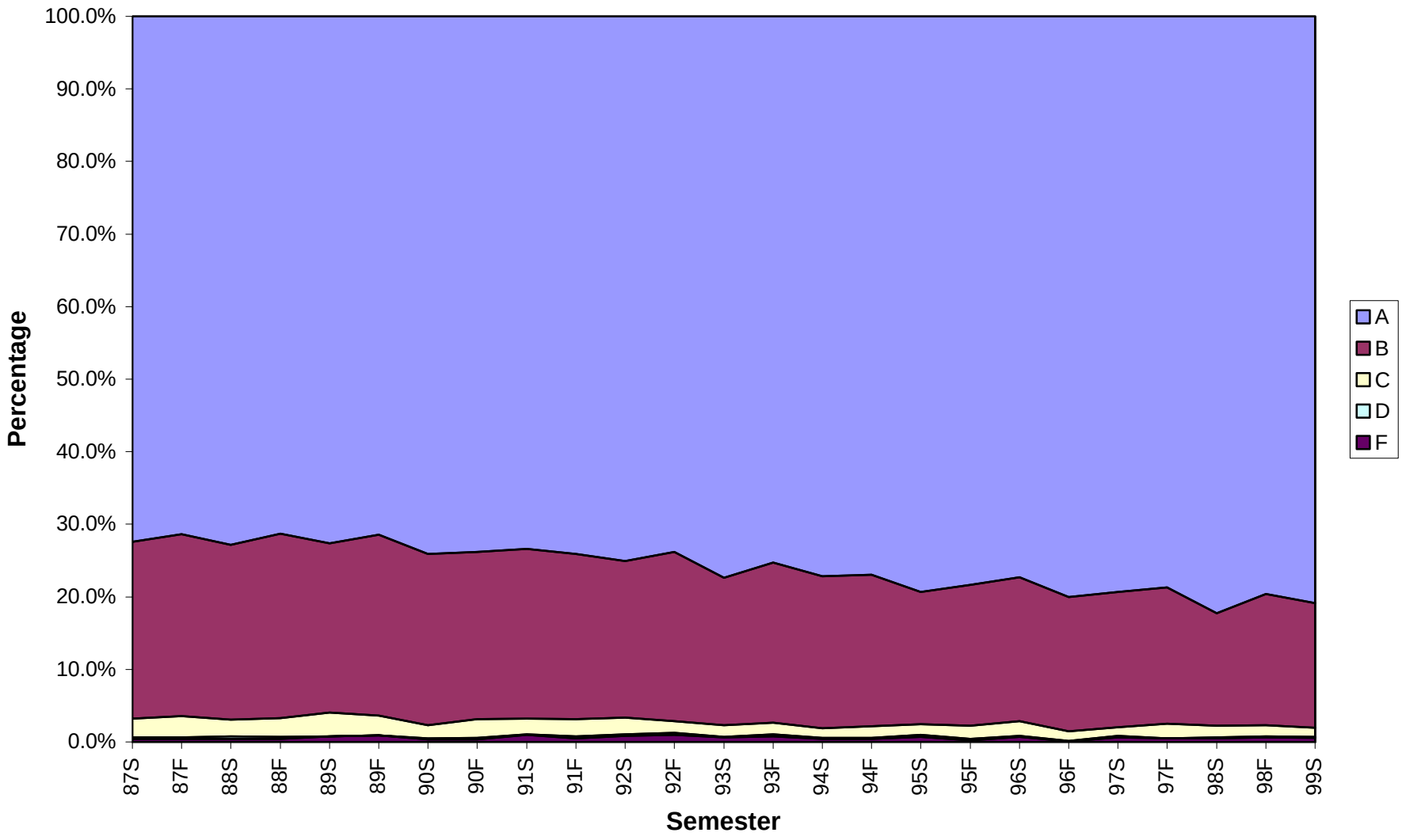

Figure 7. Grade Distribution: Writing Intensive

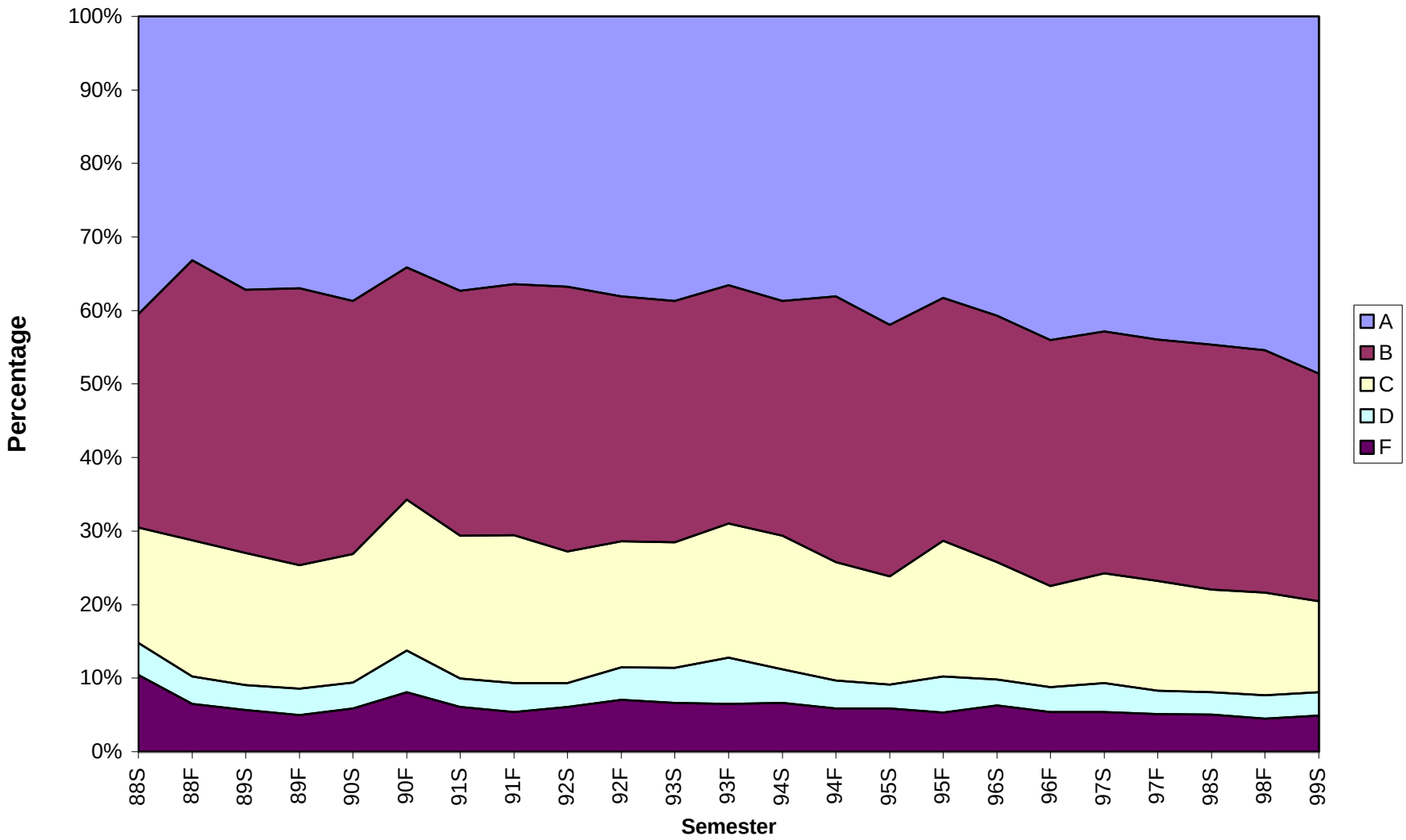

Figure 8. Mean Grades: All Categories

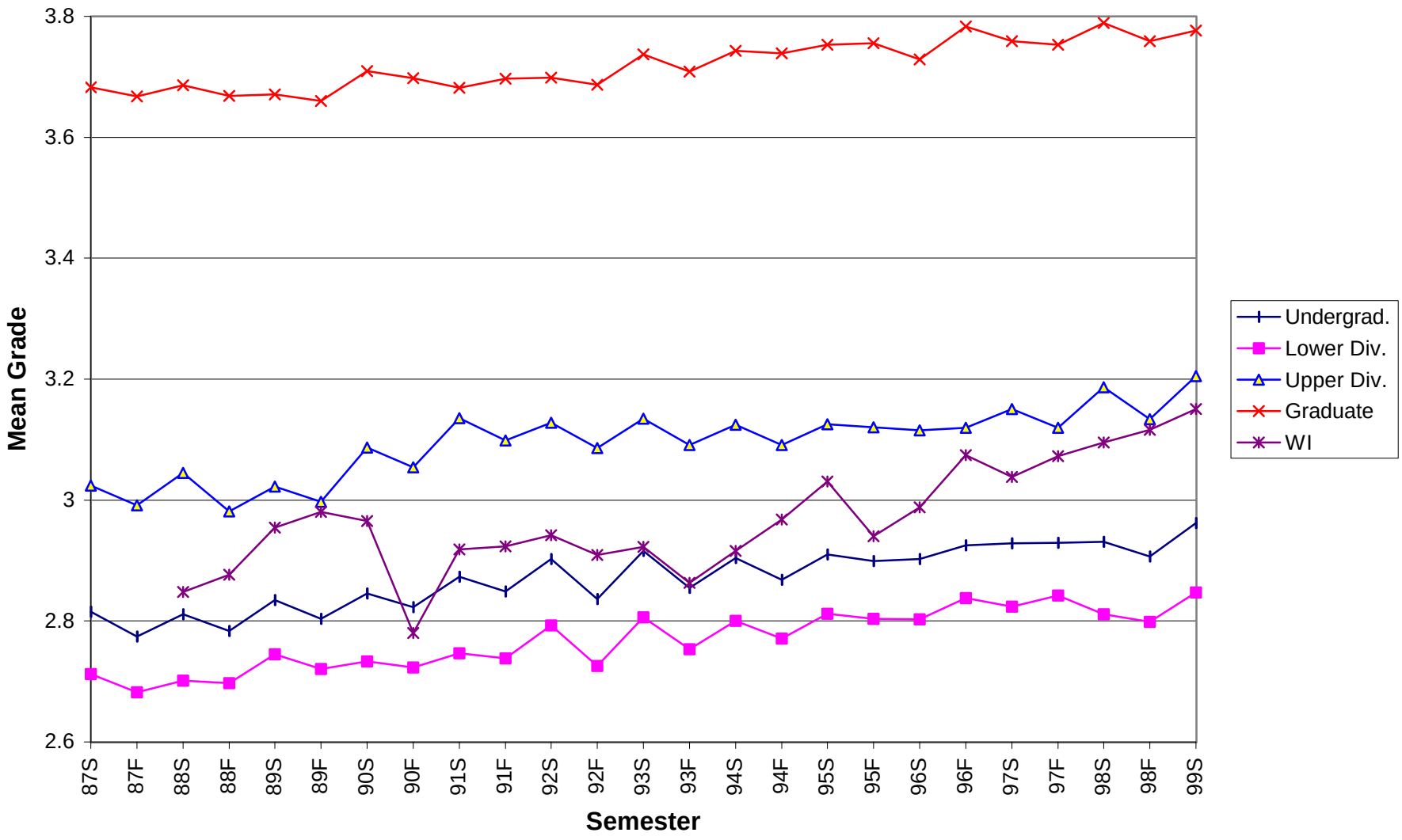

Figure 9. Ratio of Male Students

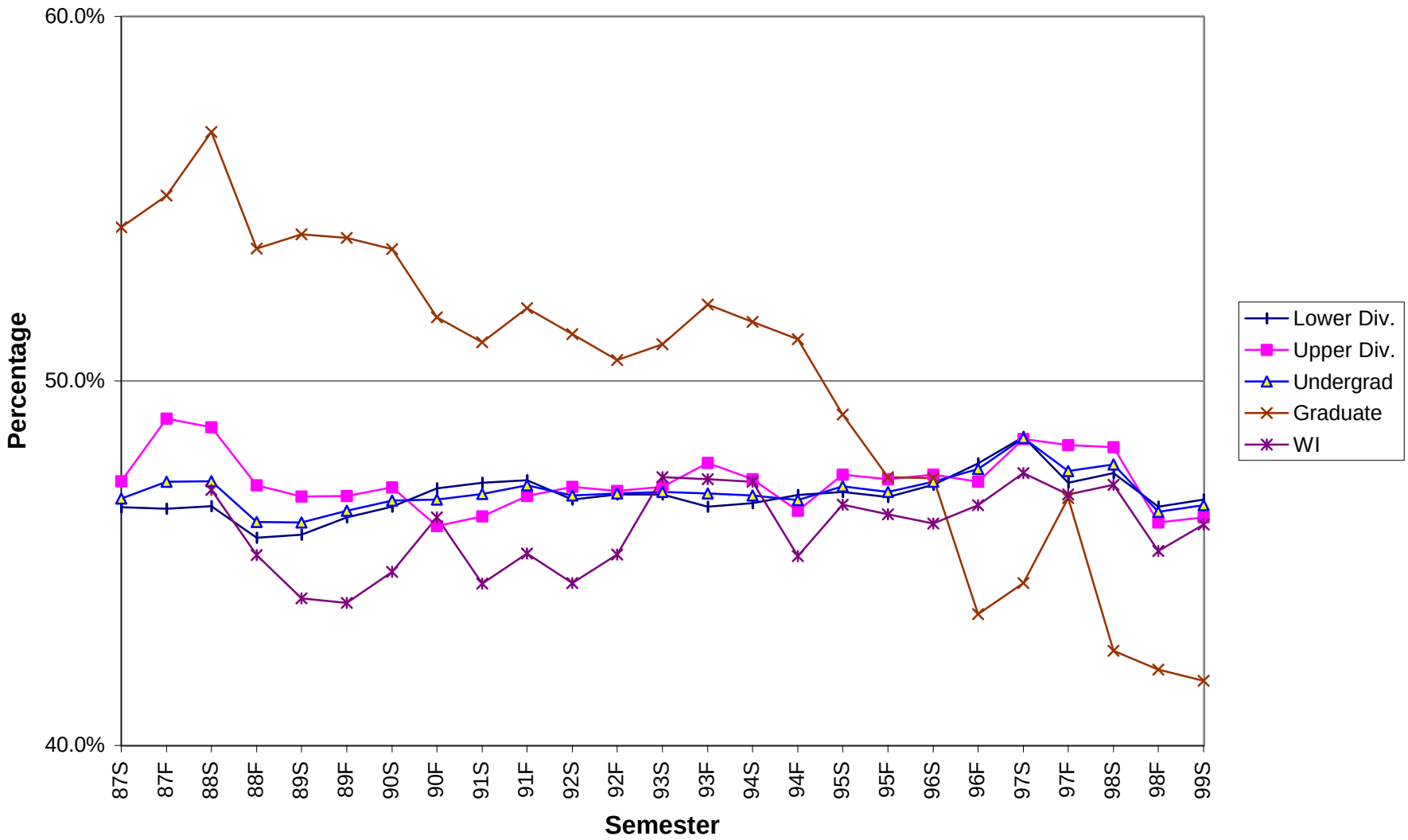

Figure 10. Mean Grades: All Levels

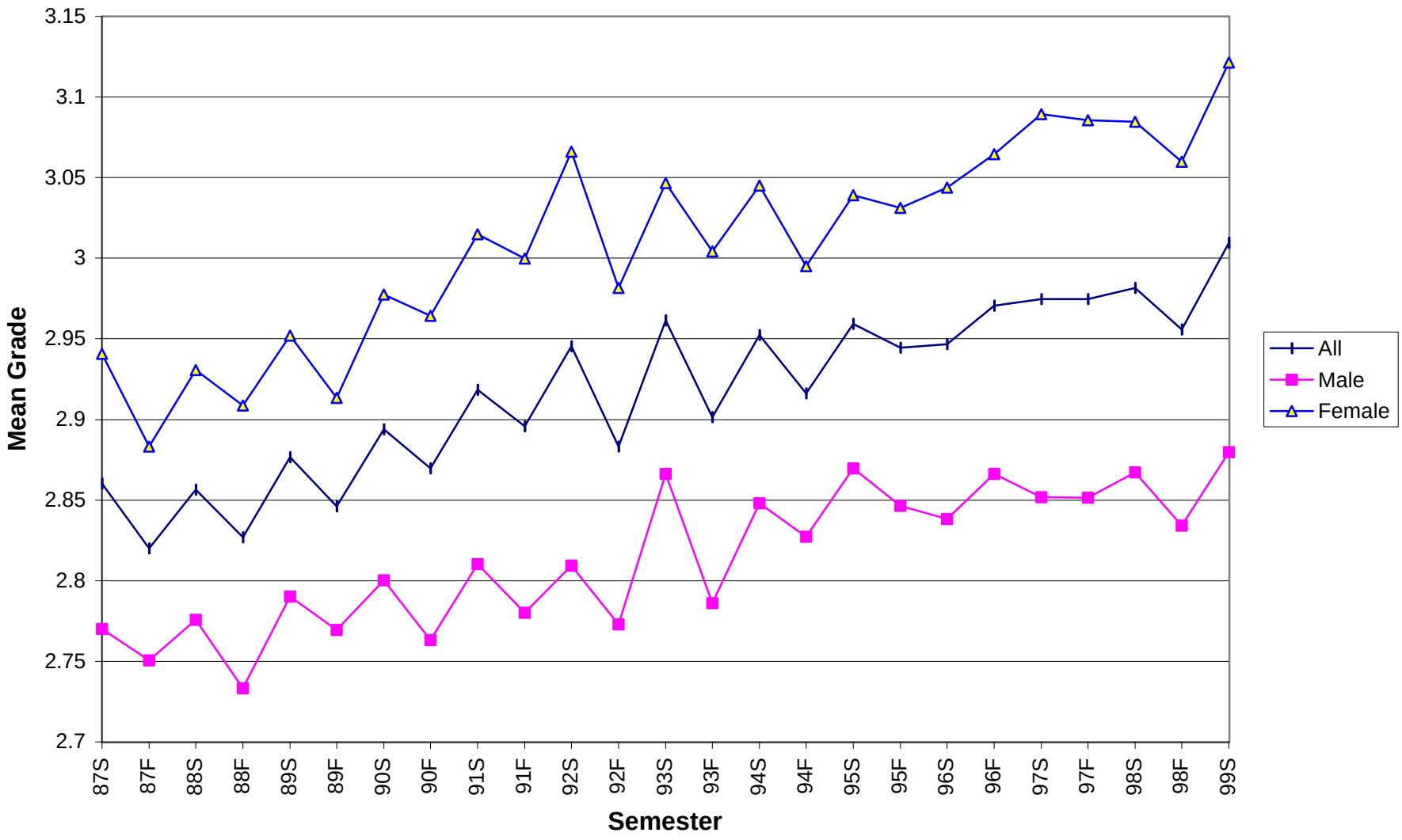

Figure 11. Mean Grades: Undergraduate

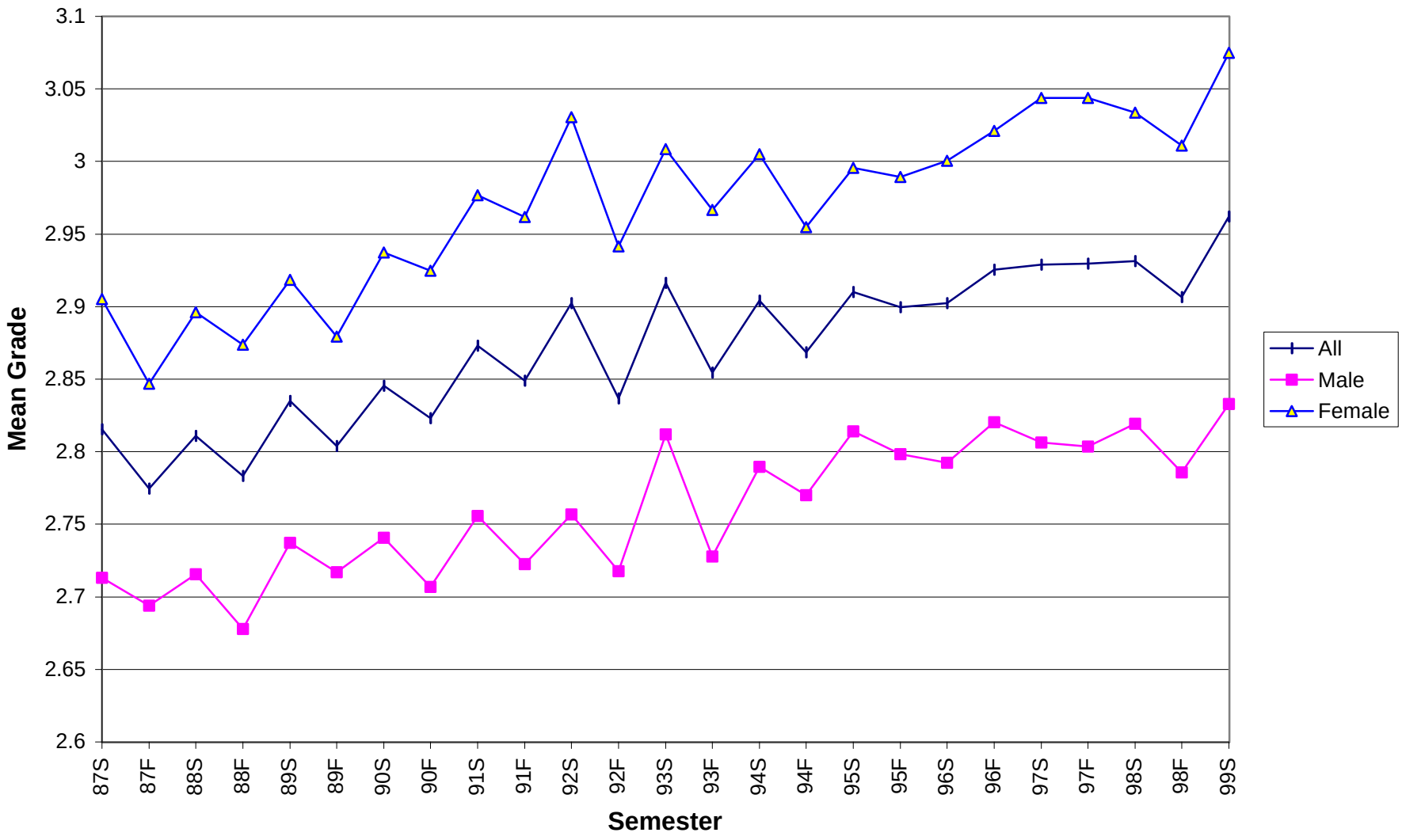

Figure 12. Mean Grades: Lower Division

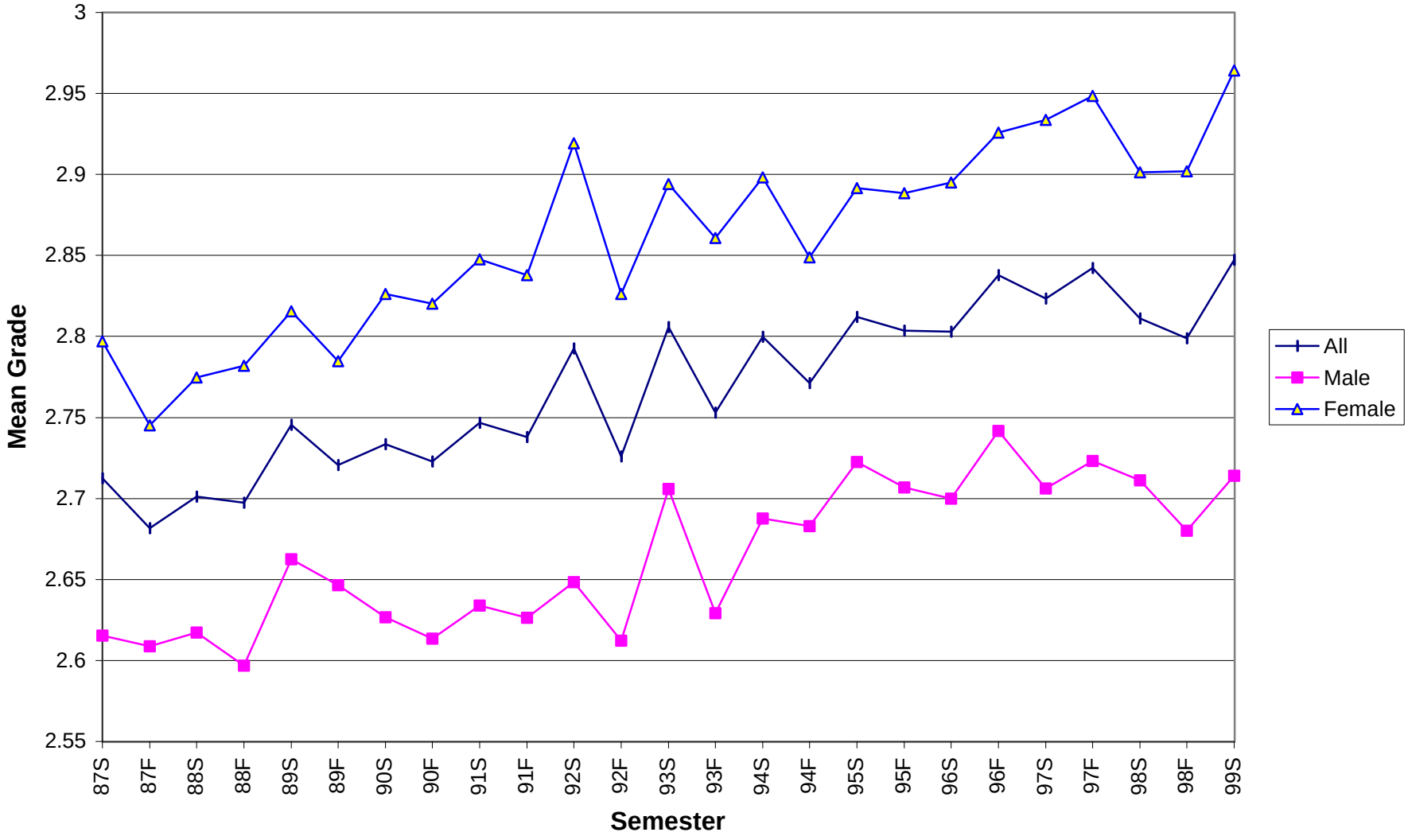

Figure 13. Mean Grades: Upper Division

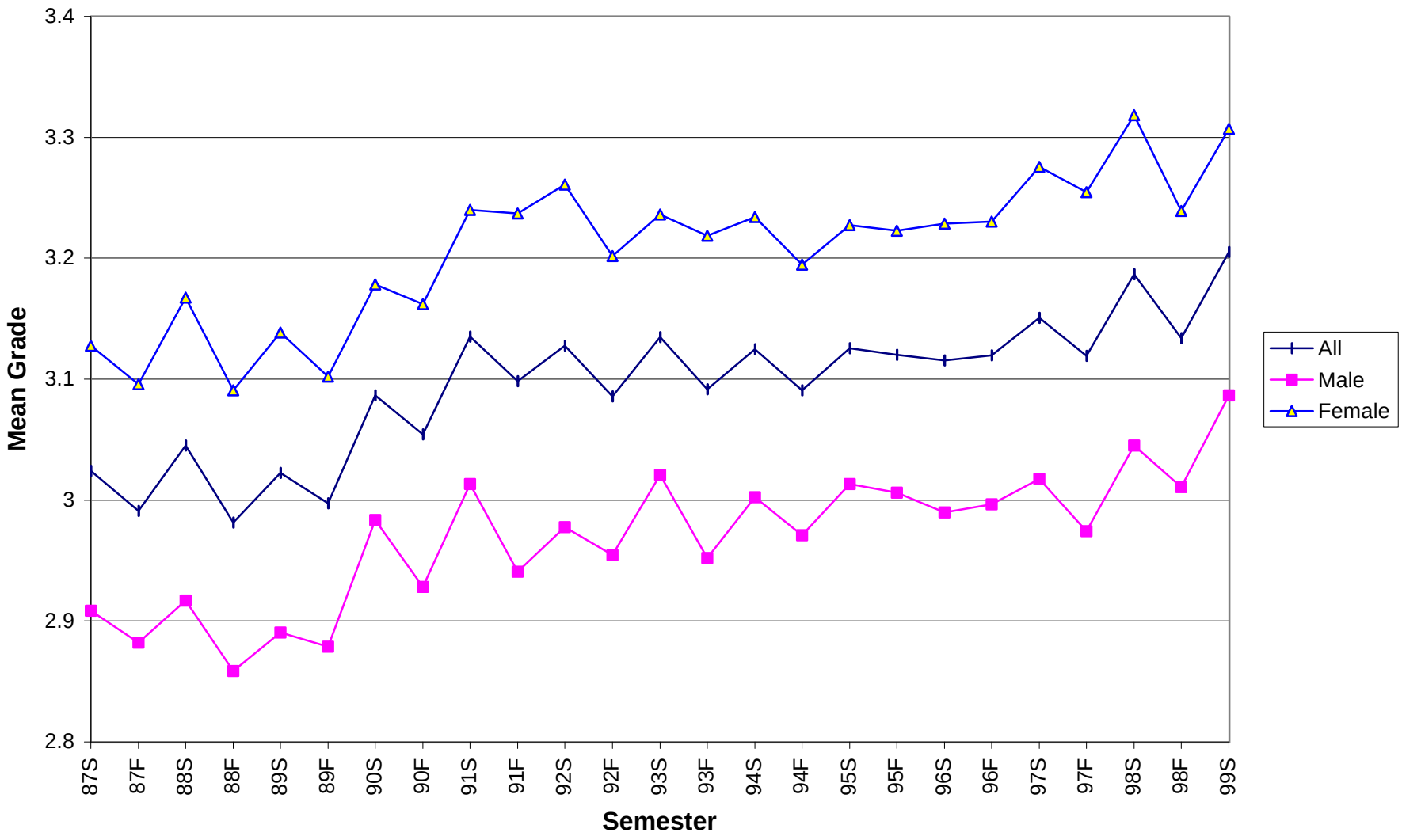

Figure 14. Mean Grades: Graduate

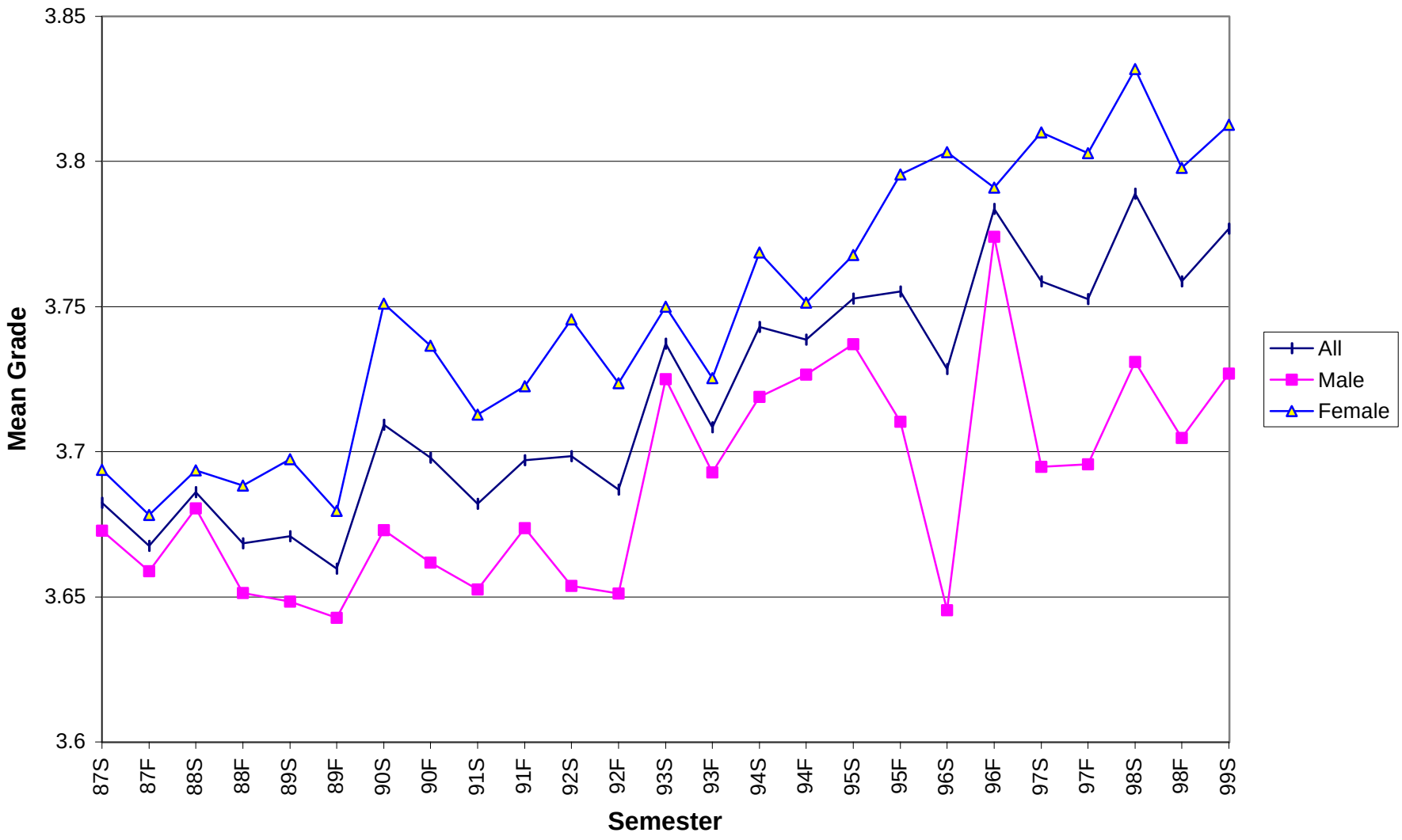

Figure 15. Mean Grades: Writing Intensive

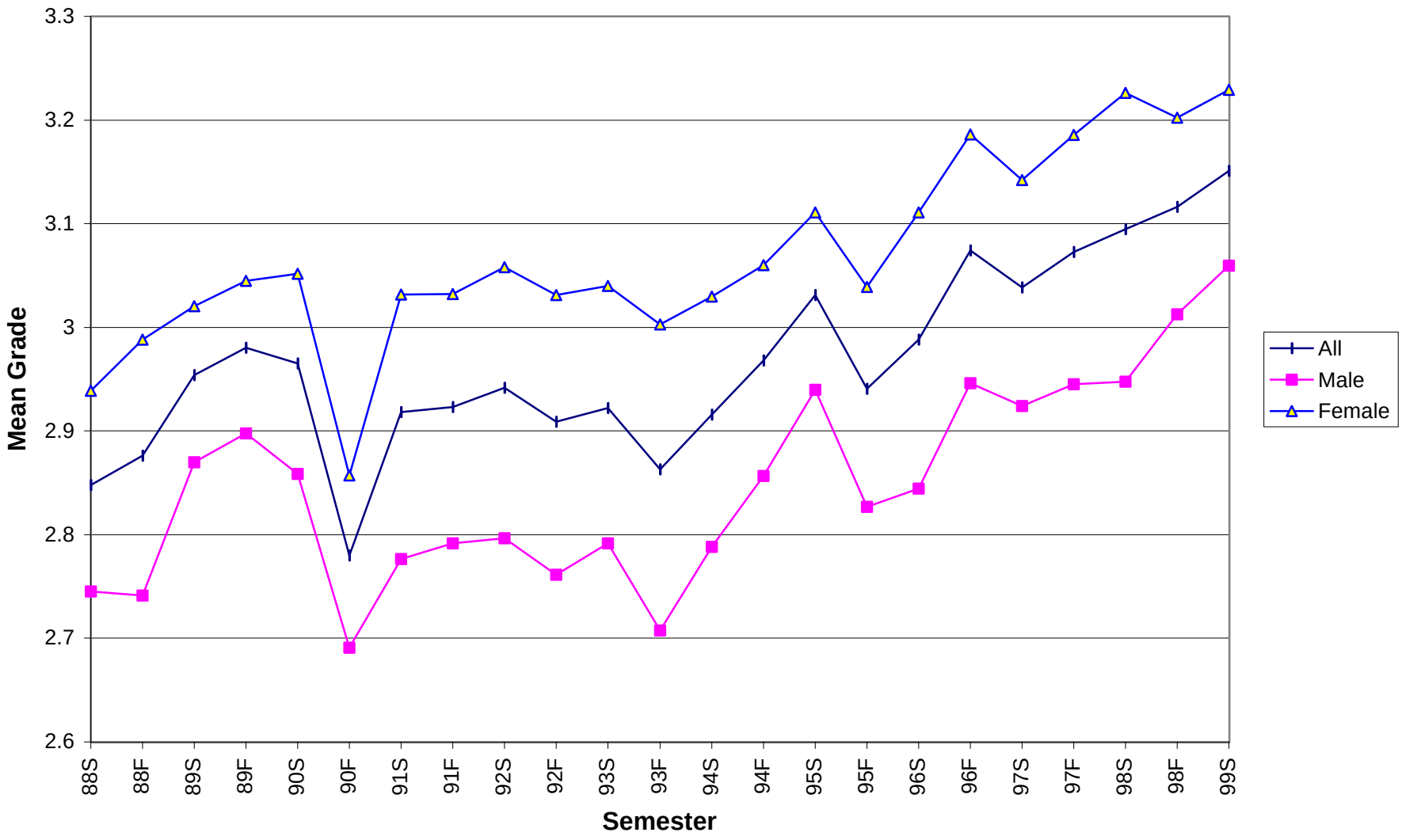

Figure 16. Mean Grade Differences between Male and Female Students

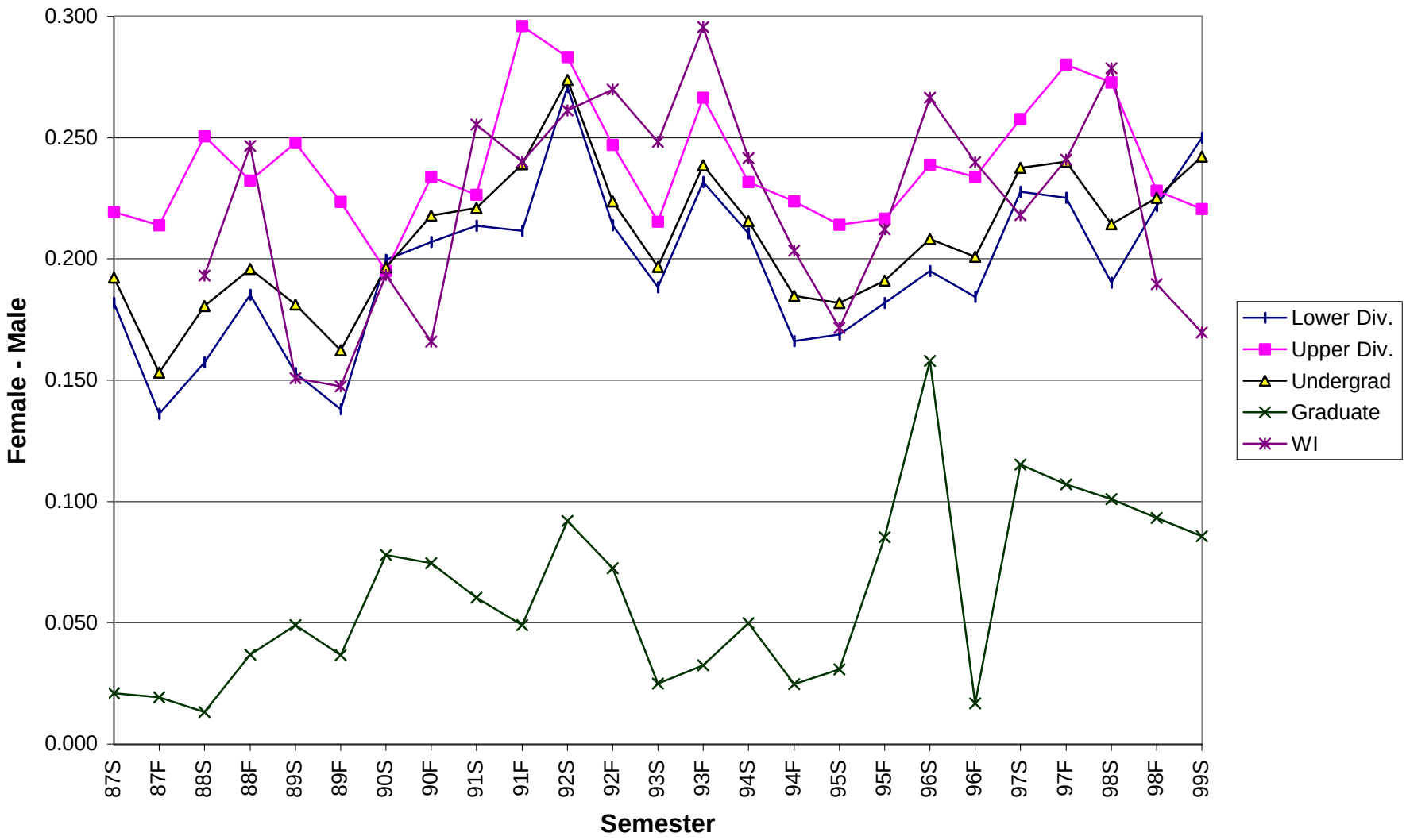

Figure 17. Enrollment in Low Grading Departments

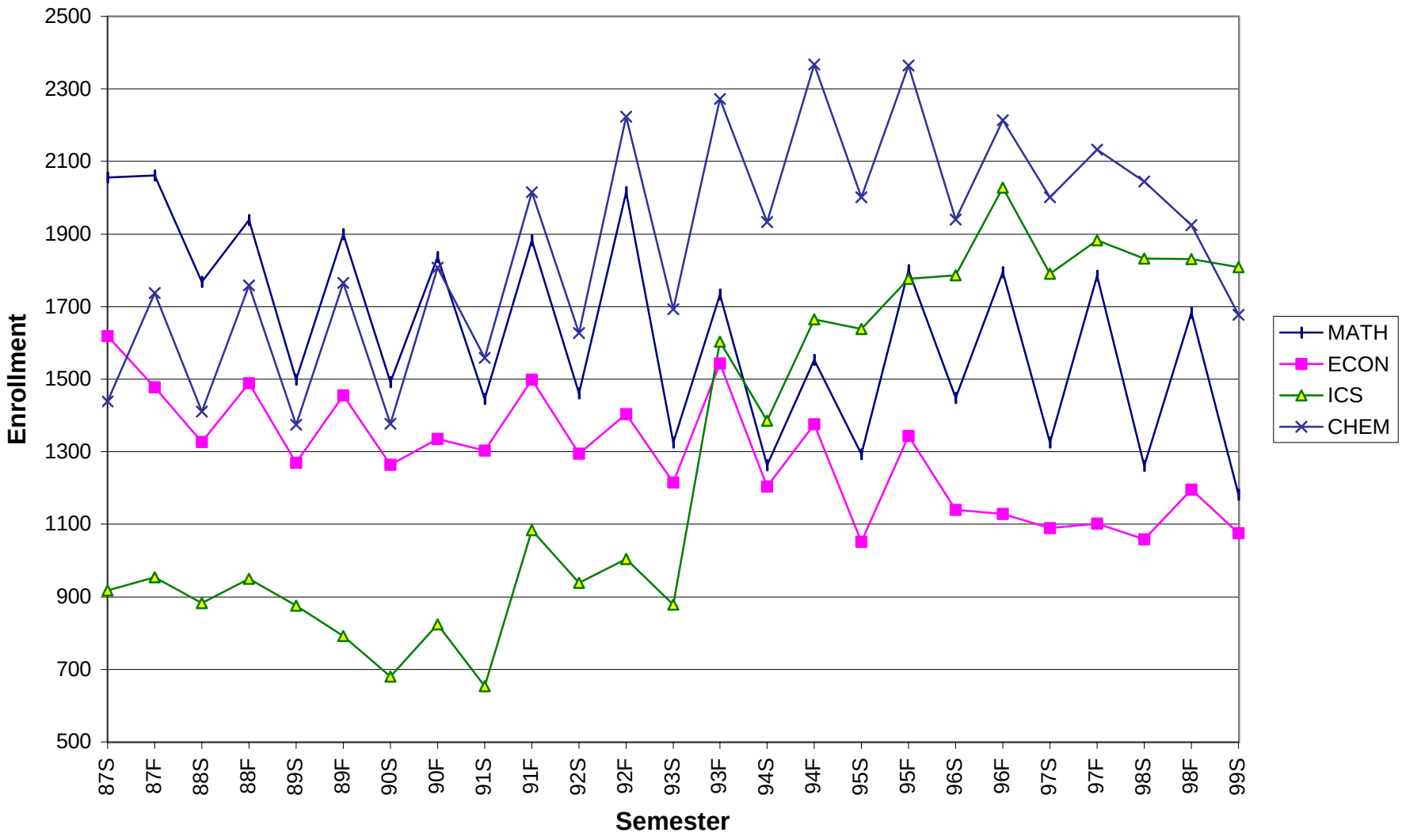

Figure 18. Enrollment in High Grading Departments

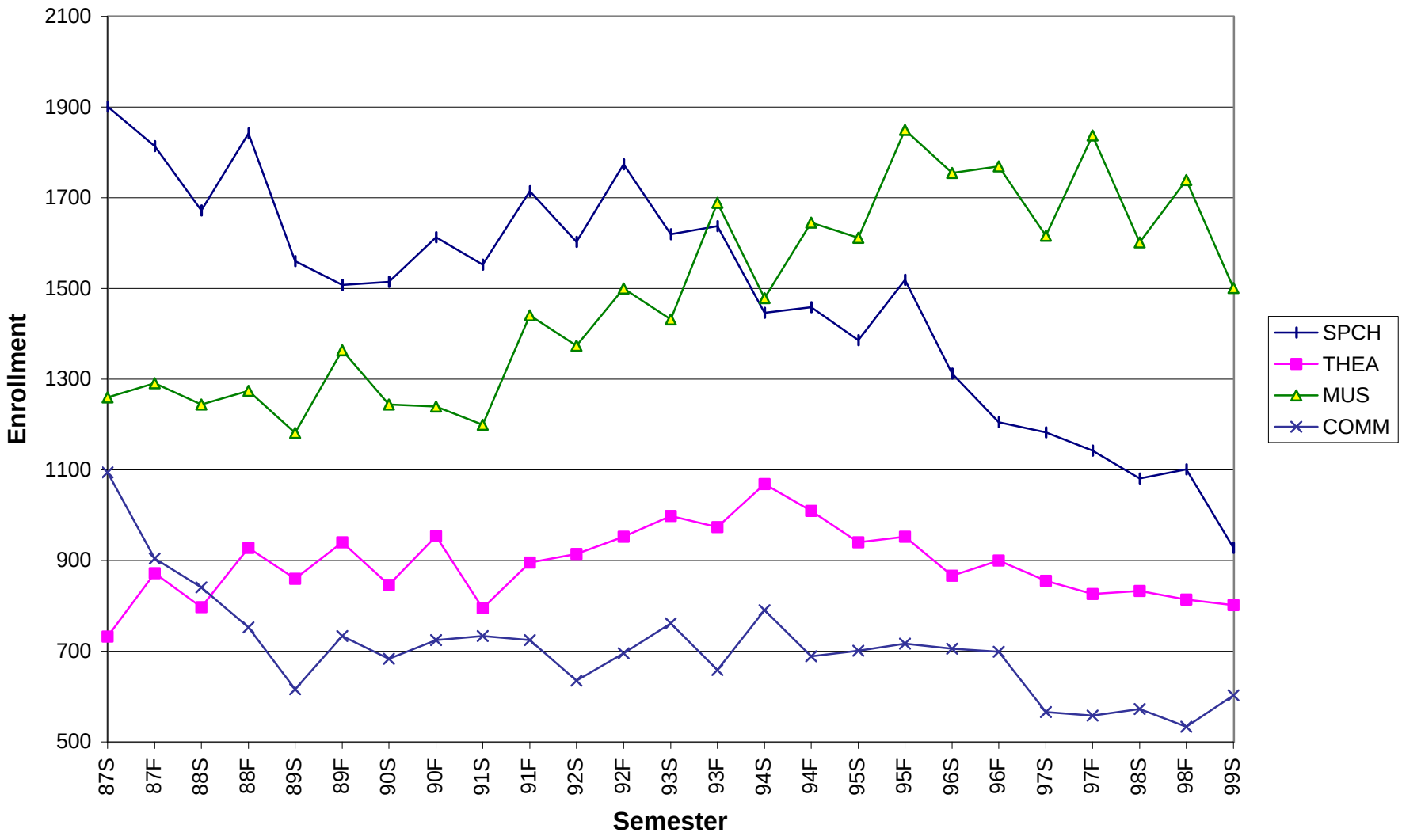

Figure 19. Grade Distribution: Mathematics Dept. (Undergraduate)

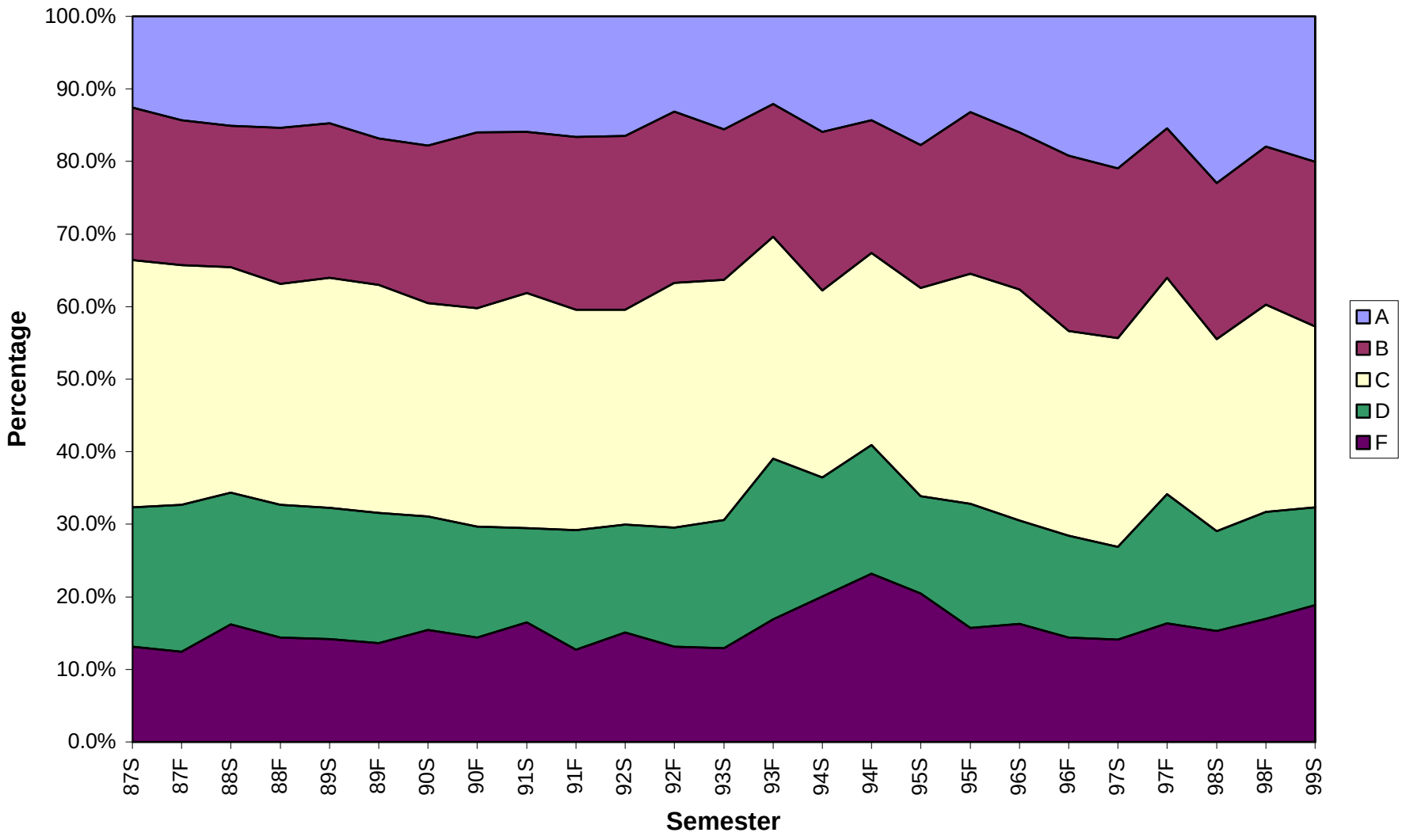

Figure 20. Undergraduate Mean Grade: Mathematics Department

Figure 21. Grade Distribution: Economics Dept. (Undergraduate)

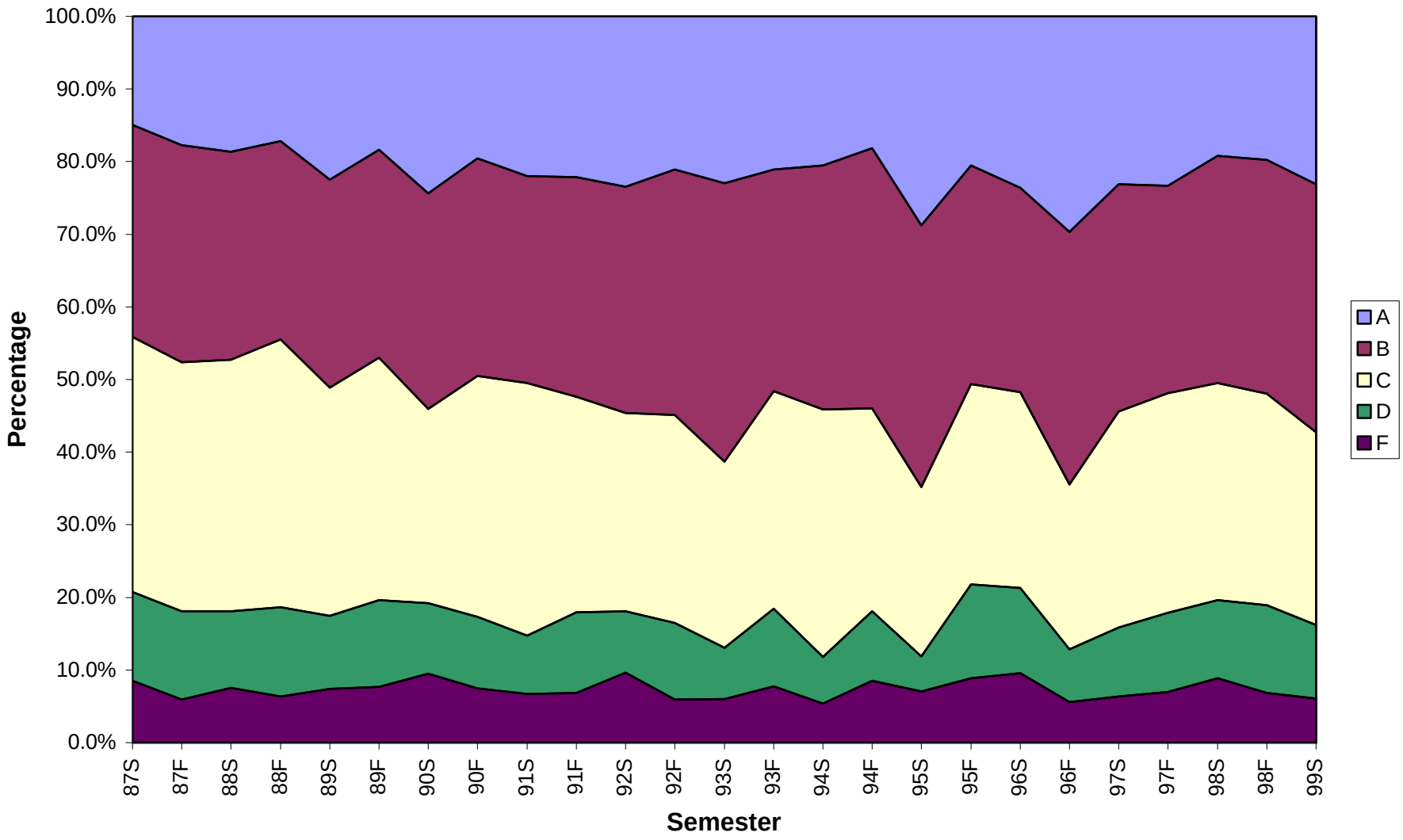

Figure 22. Undergraduate Mean Grade: Economics Department

Figure 23. Grade Distribution: Information & Computer Sciences Department (Undergraduate)

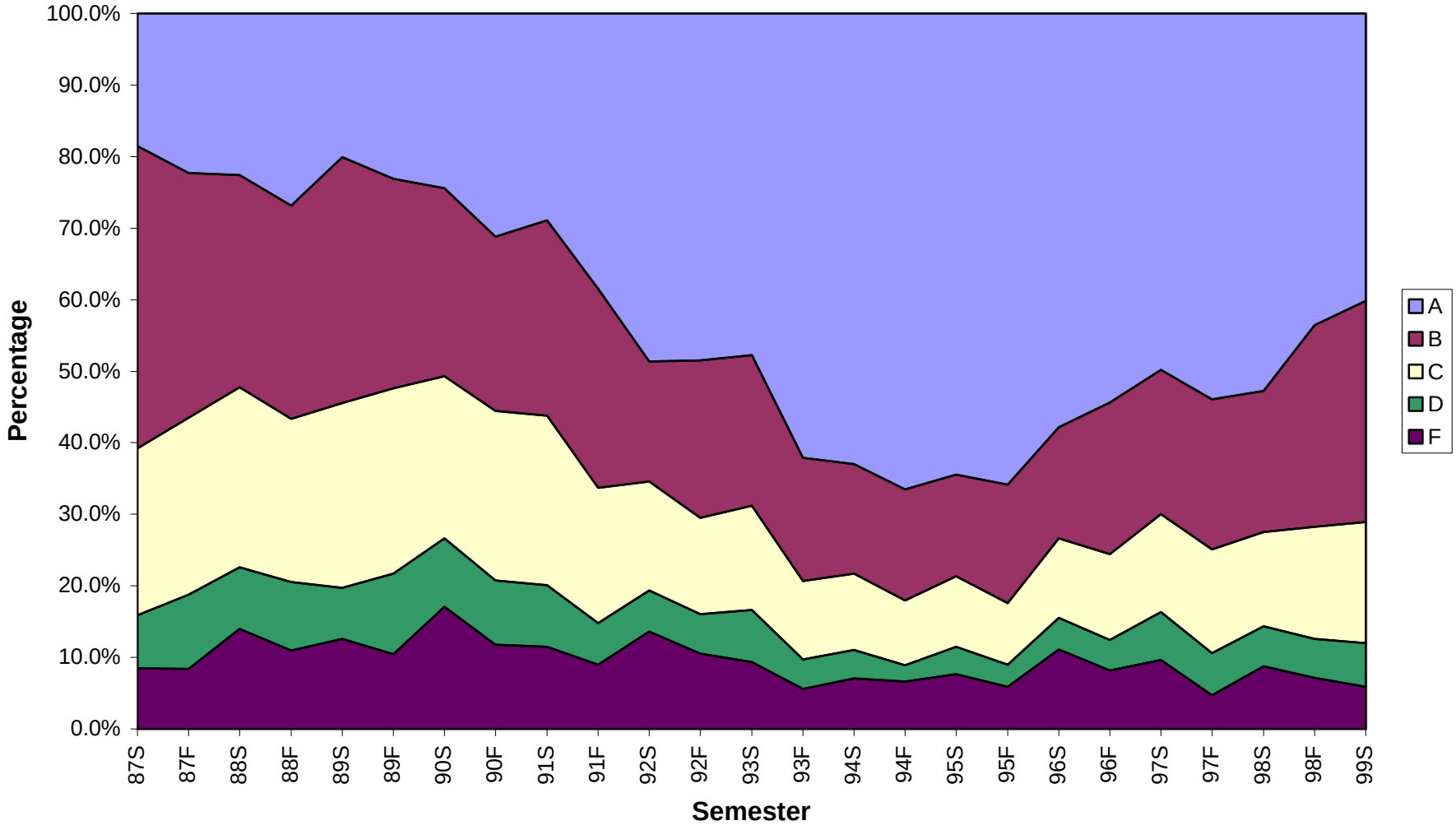

Figure 24. Undergraduate Mean Grade: Information & Computer Sciences Dept.

Figure 25. Grade Distribution: Chemistry Dept. (Undergraduate)

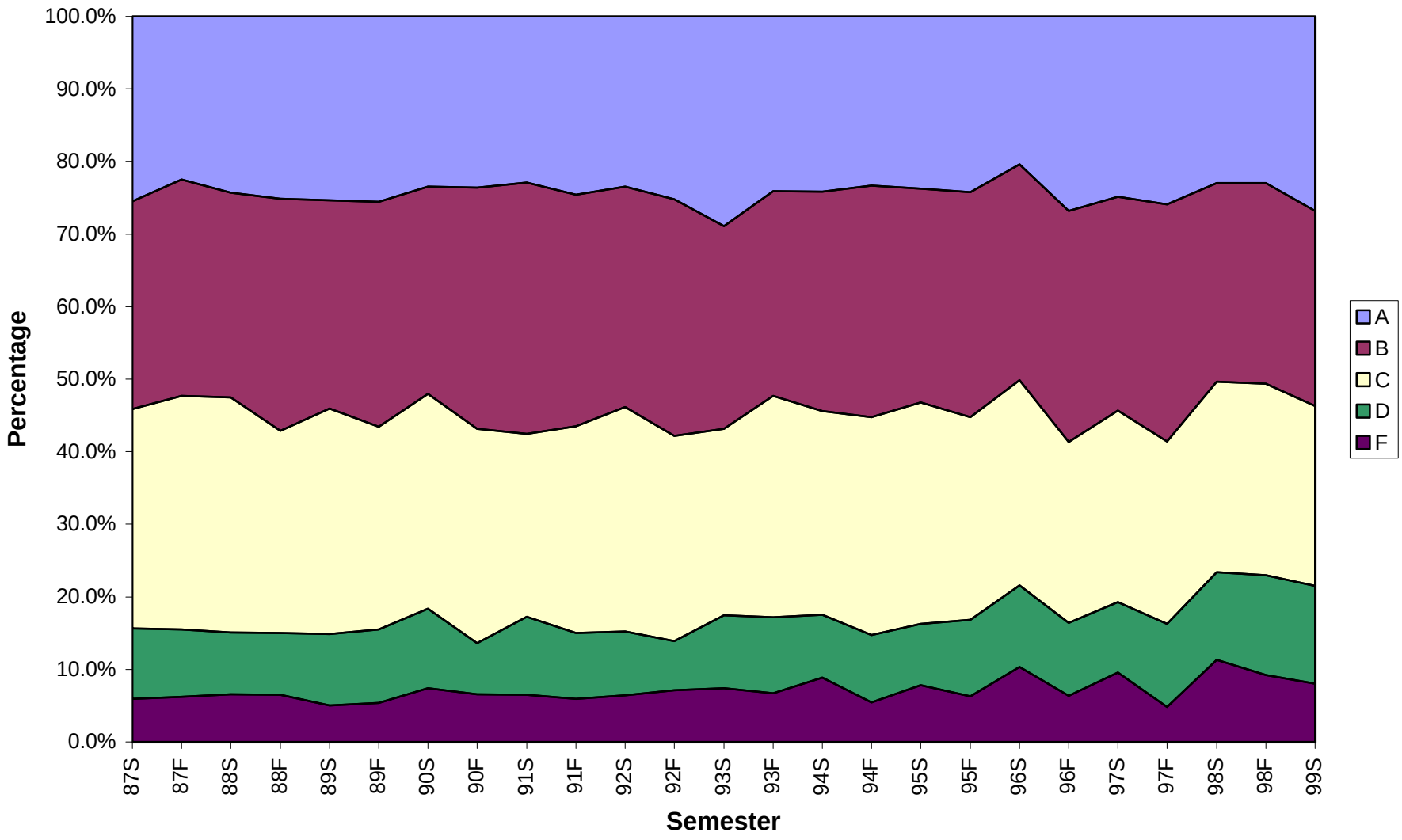

Figure 26. Undergraduate Mean Grade: Chemistry Department

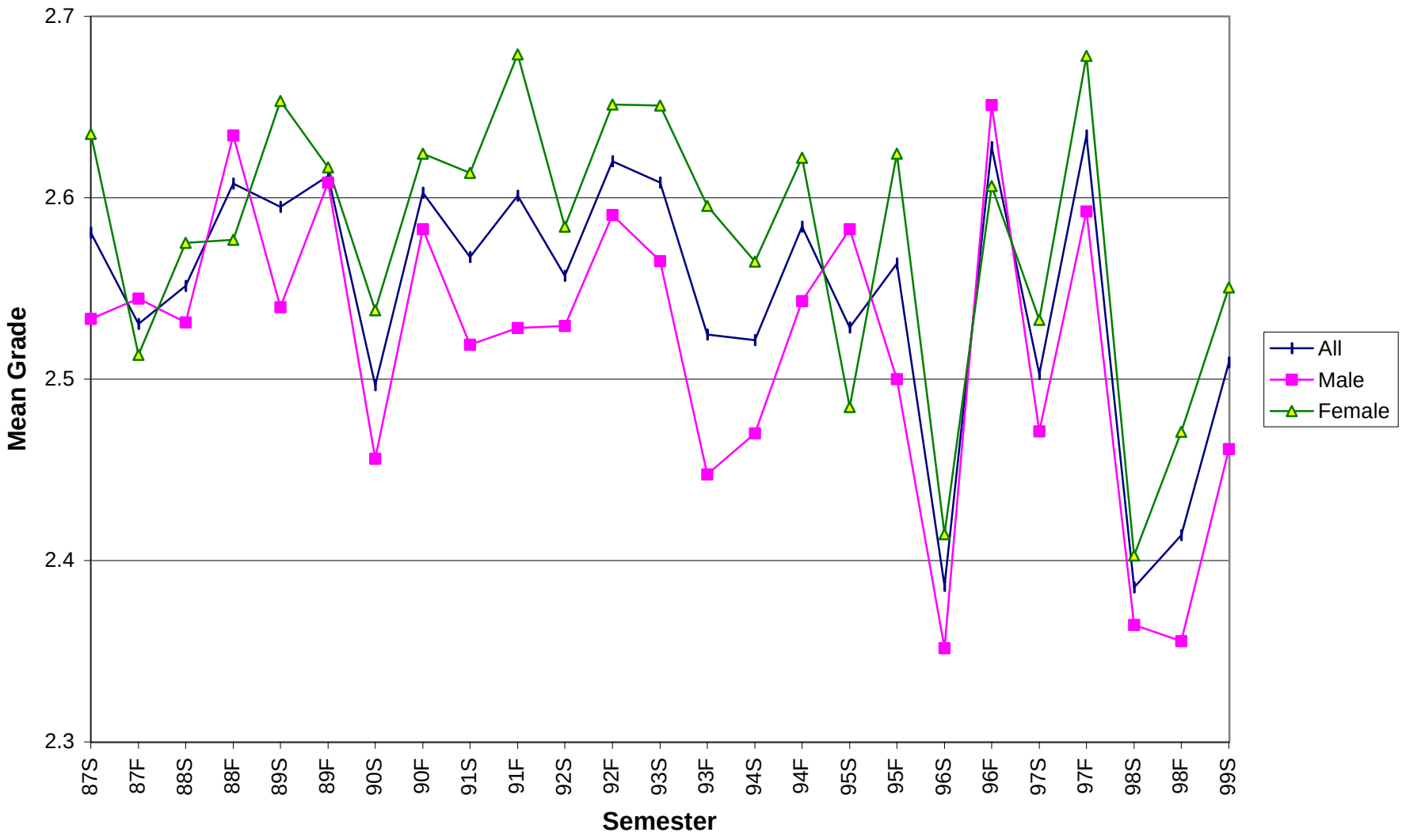

Figure 27. Grade Distribution: Speech Dept. (Undergraduate)

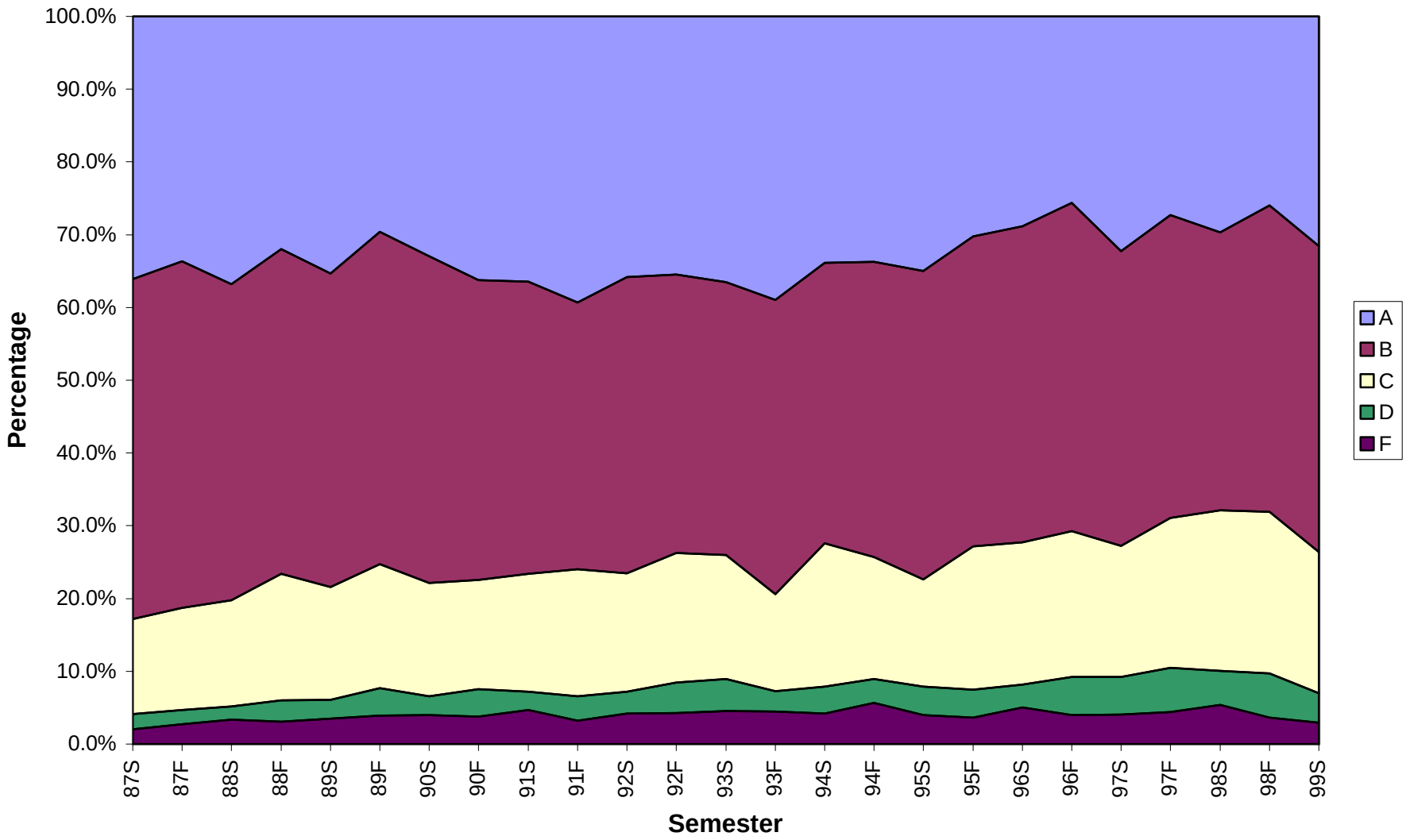

Figure 28. Undergraduate Mean Grade: Speech Department

Figure 29. Grade Distribution: Theatre and Dance Dept. (Undergraduate)

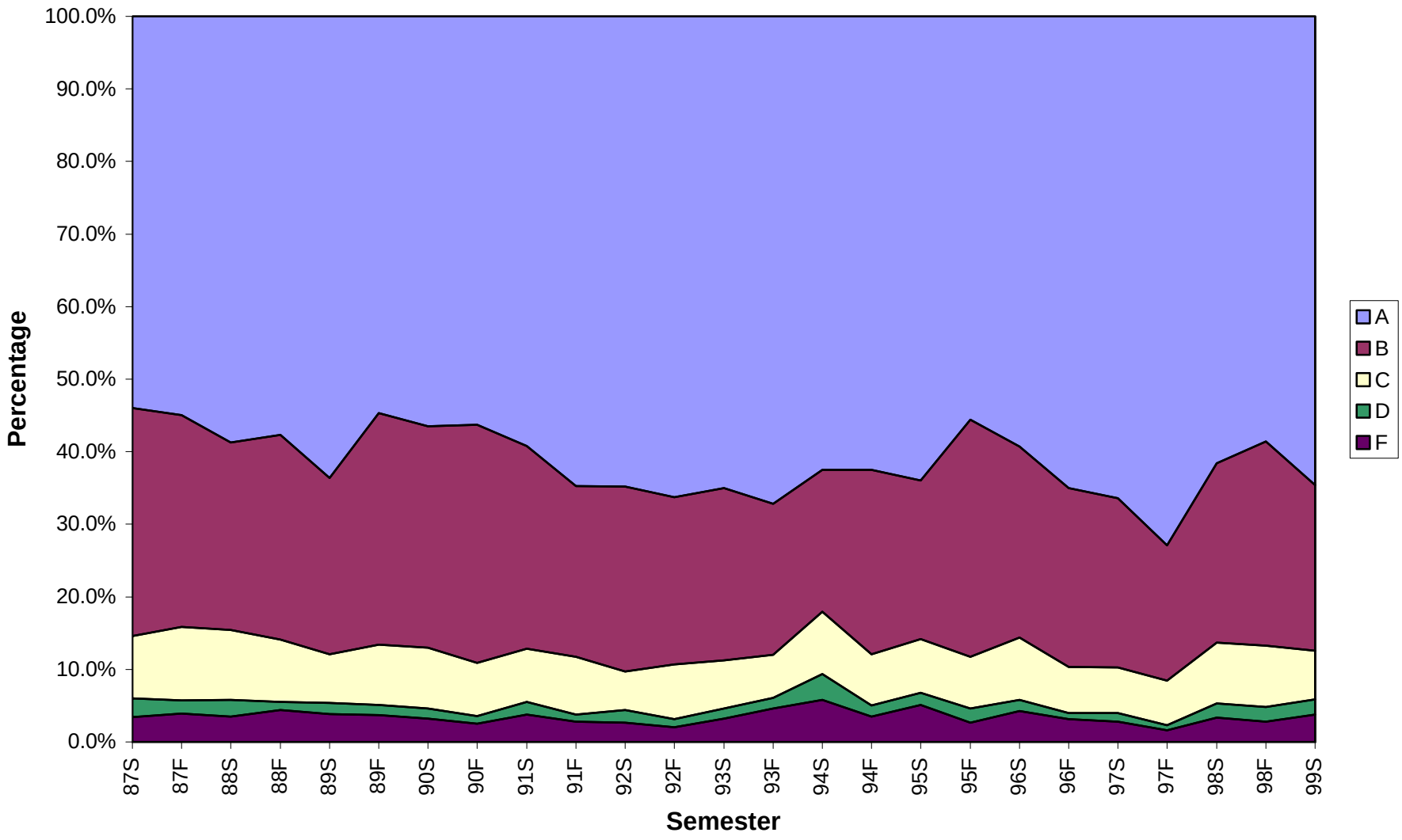

Figure 30. Undergraduate Mean Grade: Theatre & Dance Department

Figure 31. Grade Distribution: Music Dept. (Undergraduate)

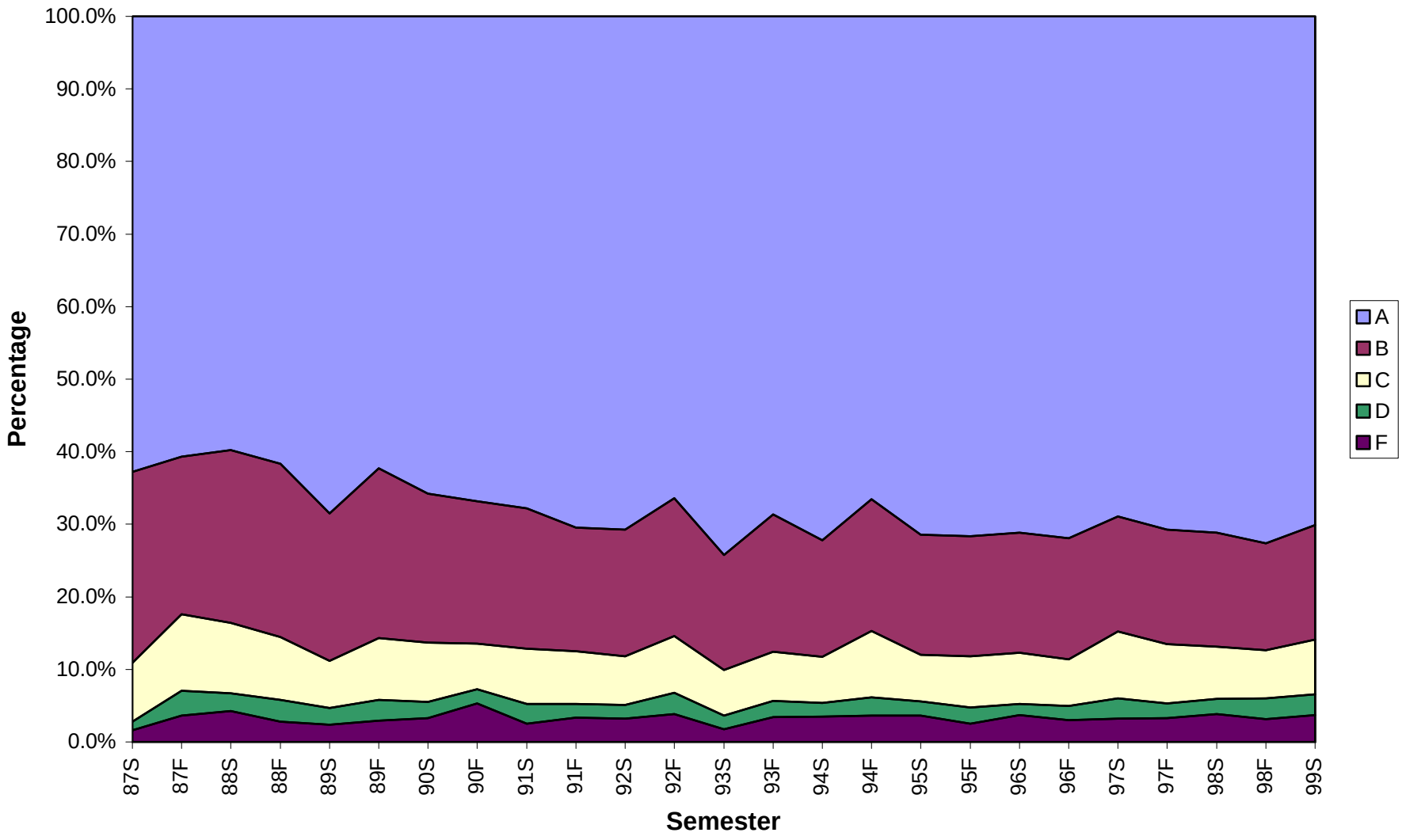

Figure 32. Undergraduate Average Grade: Music Department

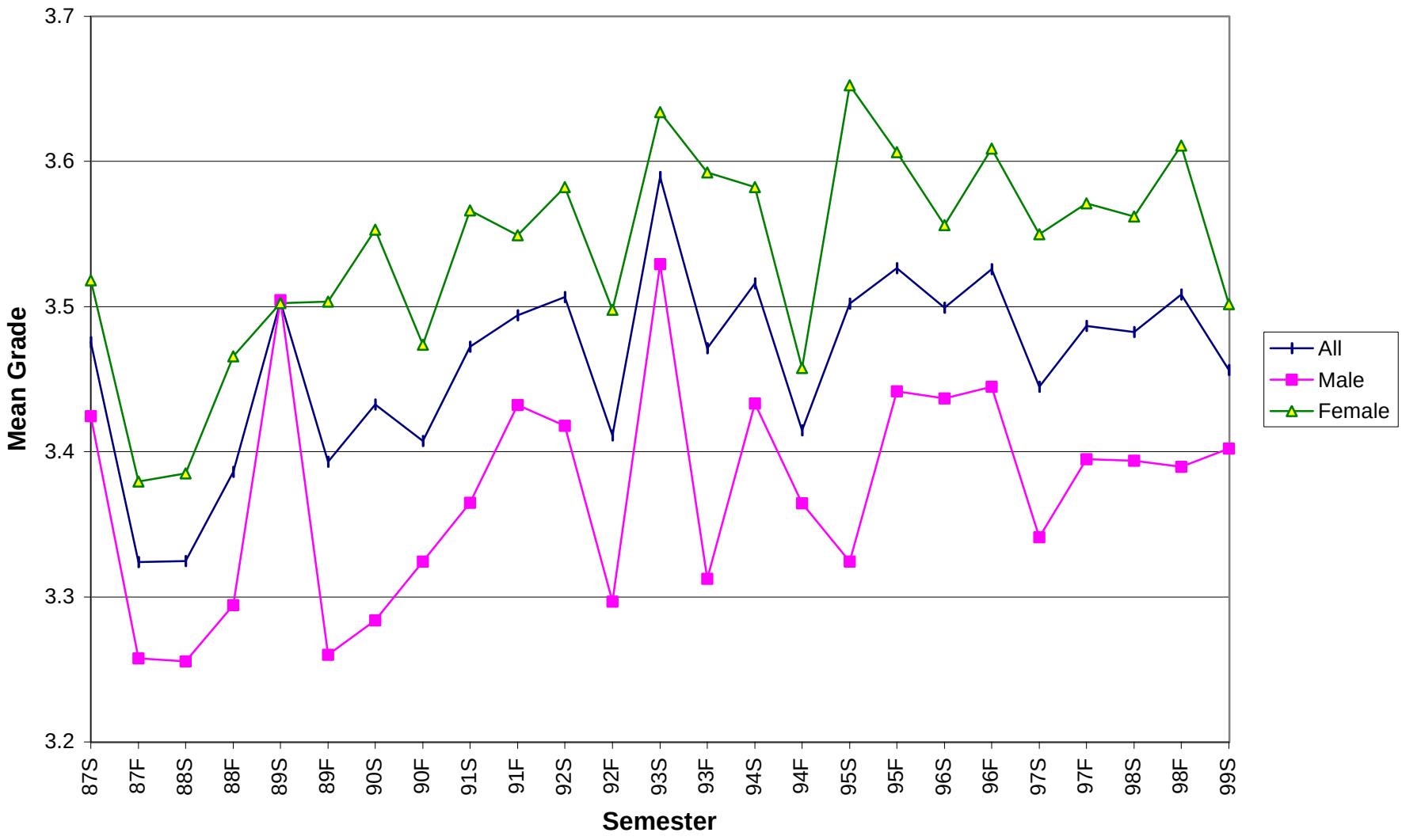

Figure 33. Grade Distribution: Communication Dept. (Undergraduate)

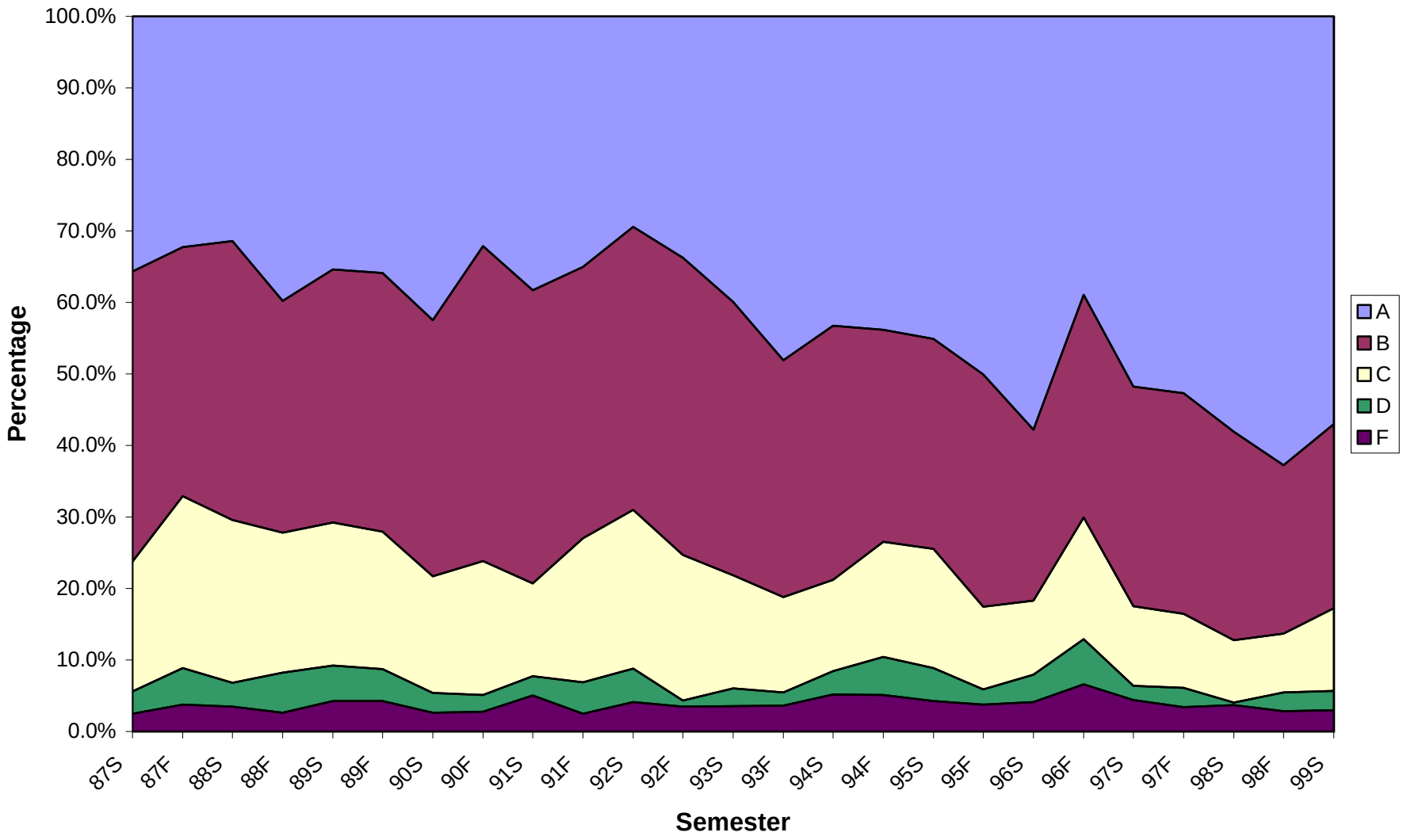

Figure 34. Undergraduate Mean Grade: Communication Department

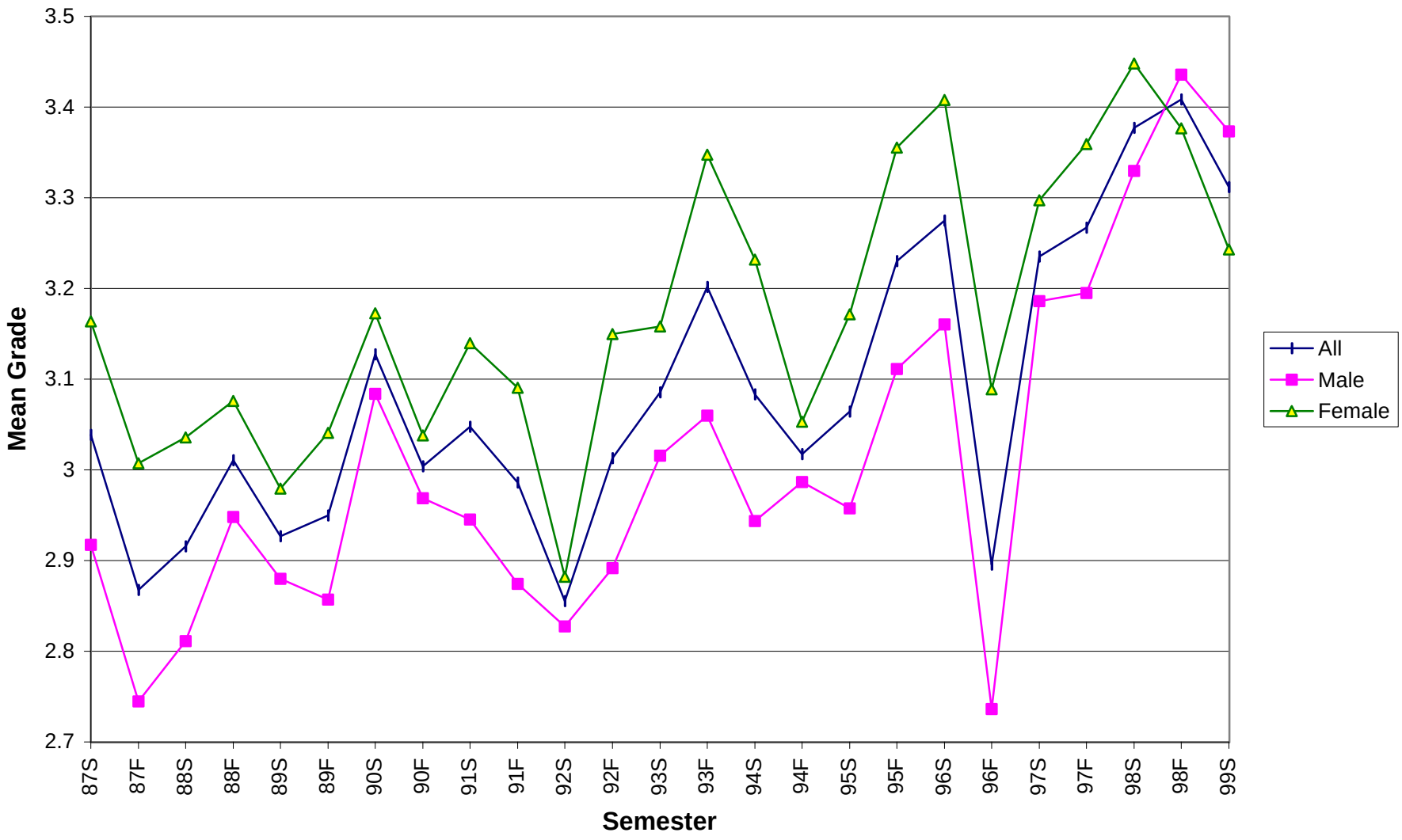

Table 1. All Levels

Regressand: Mean grades
Regressors: Spring, Trend

Source	SS	df	MS		
Model	.061988567	2	.030994284	Number of obs	25
Residual	.004816368	22	.000218926	F(2, 22)	141.57
Total	.066804935	24	.002783539	Prob > F	0.0000
				R-squared	0.9279
				Adj R-squared	0.9213
				Root MSE	.0148

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spring	.0332314	.0059232	5.610	0.000	.0209475	.0455154
Trend	.0065102	.0004104	15.864	0.000	.0056591	.0073613
constant	2.815736	.006834	412.016	0.000	2.801563	2.829909

Durbin-Watson d-statistic(3, 25) = 2.492047

Table 7. All Levels

```
Seemingly Unrelated Regression
      Regressands: Mean grades of male students (mave)
                   Mean grades of female students (fave)
      Regressors: Spring, Trend


------------------------------------------------------------------------------
Equation      Obs  Parms        RMSE    "R-sq"     F-Stat        P
------------------------------------------------------------------------------
mave           25      2    .0172466    0.8543   64.50461   0.0000
fave           25      2    .0213023    0.8982   97.09925   0.0000
------------------------------------------------------------------------------
             |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
mave         |
      Spring |   .0306195   .0069042      4.435   0.000        .016705    .0445339
       Trend |   .0050018   .0004783     10.457   0.000       .0040377    .0059658
    constant |   2.733375   .0079659    343.136   0.000       2.717321    2.749429
-------------+----------------------------------------------------------------
fave         |
      Spring |   .0360794   .0085277      4.231   0.000       .0188929    .0532659
       Trend |   .0078447   .0005908     13.278   0.000        .006654    .0090355
    constant |   2.888998   .0098391    293.624   0.000       2.869169    2.908828
------------------------------------------------------------------------------

Correlation matrix of residuals:

            mave    fave
mave      1.0000
fave      0.1645  1.0000

Breusch-Pagan test of independence: chi2(1) =     0.677, Pr = 0.4107
```

Table 2. Undergraduate

Regressand: Mean grades
Regressors: Spring, Trend

Source	SS	df	MS	Number of obs =	25
Model	.059603025	2	.029801512	F(2, 22) =	126.34
Residual	.005189306	22	.000235878	Prob > F =	0.0000
Total	.064792331	24	.00269968	R-squared =	0.9199
				Adj R-squared =	0.9126
				Root MSE =	.01536

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spring	.0329042	.0061482	5.352	0.000	.0201535	.0456549
Trend	.0063759	.000426	14.968	0.000	.0054925	.0072593
constant	2.77167	.0070937	390.723	0.000	2.756958	2.786381

Durbin-Watson d-statistic(3, 25) = 2.523452

Table 8. Undergraduate

```
Seemingly Unrelated Regression
      Regressands: Mean grades of male students (mave)
                   Mean grades of female students (fave)
      Regressors: Spring, Trend


------------------------------------------------------------------------------
Equation      Obs  Parms        RMSE    "R-sq"     F-Stat        P
------------------------------------------------------------------------------
mave           25      2      .01726    0.8723    75.1566   0.0000
fave           25      2    .0222867    0.8755   77.38769   0.0000
------------------------------------------------------------------------------
             |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
mave         |
      Spring |    .030653   .0069095      4.436   0.000       .0167278    .0445783
       Trend |   .0054714   .0004787     11.429   0.000       .0045066    .0064361
    constant |   2.674023   .0079721    335.424   0.000       2.657956     2.69009
-------------+----------------------------------------------------------------
fave         |
      Spring |   .0354876   .0089218      3.978   0.000       .0175069    .0534683
       Trend |   .0072863   .0006181     11.788   0.000       .0060406    .0085321
    constant |   2.856487   .0102938    277.497   0.000       2.835741    2.877232
------------------------------------------------------------------------------

Correlation matrix of residuals:

            mave    fave
mave      1.0000
fave      0.1742  1.0000

Breusch-Pagan test of independence: chi2(1) =     0.759, Pr = 0.3838
```

Table 3. Lower Division

Regressand: Mean grades
Regressors: Spring, Trend

Source	SS	df	MS		
Model	.051906317	2	.025953159	Number of obs	25
Residual	.007424837	22	.000337493	F(2, 22)	76.90
Total	.059331154	24	.002472131	Prob > F	0.0000
				R-squared	0.8749
				Adj R-squared	0.8635
				Root MSE	.01837

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spring	.0218606	.0073543	2.972	0.007	.0066087	.0371124
Trend	.0061347	.0005095	12.040	0.000	.005078	.0071913
constant	2.677997	.0084852	315.608	0.000	2.660399	2.695594

Durbin-Watson d-statistic(3, 25) = 2.648394

Table 9. Lower Division

```
Seemingly Unrelated Regression
      Regressands: Mean grades of male students (mave)
                   Mean grades of female students (fave)
      Regressors: Spring, Trend


------------------------------------------------------------------------------
Equation      Obs  Parms        RMSE    "R-sq"     F-Stat        P
------------------------------------------------------------------------------
mave           25      2    .0243411    0.7305   29.81073   0.0000
fave           25      2    .0231977    0.8589   66.96819   0.0000
------------------------------------------------------------------------------
             |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
mave         |
      Spring |   .0175222   .0097443      1.798   0.079       -.002116    .0371605
       Trend |   .0050695   .0006751      7.509   0.000       .0037089      .00643
    constant |   2.589759   .0112427    230.350   0.000         2.5671    2.612417
-------------+----------------------------------------------------------------
fave         |
      Spring |   .0261644   .0092865      2.817   0.007       .0074487    .0448802
       Trend |    .007222   .0006434     11.225   0.000       .0059253    .0085186
    constant |   2.753688   .0107146    257.004   0.000       2.732094    2.775282
------------------------------------------------------------------------------

Correlation matrix of residuals:

            mave    fave
mave      1.0000
fave      0.2088  1.0000

Breusch-Pagan test of independence: chi2(1) =     1.090, Pr = 0.2965
```

Table 4. Upper Division

Regressand: Mean grades
Regressors: Spring, Trend

Source	SS	df	MS		
Model	.068744896	2	.034372448	Number of obs	25
Residual	.012534507	22	.00056975	F(2, 22)	60.33
Total	.081279403	24	.003386642	Prob > F	0.0000
				R-squared	0.8458
				Adj R-squared	0.8318
				Root MSE	.02387

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spring	.0404403	.0095554	4.232	0.000	.0206235	.060257
Trend	.0067105	.000662	10.136	0.000	.0053375	.0080834
constant	2.98645	.0110248	270.884	0.000	2.963586	3.009314

Durbin-Watson d-statistic(3, 25) = .904181

Table 10. Upper Division

```
Seemingly Unrelated Regression
      Regressands: Mean grades of male students (mave)
                   Mean grades of female students (fave)
      Regressors: Spring, Trend


------------------------------------------------------------------------------
Equation      Obs  Parms        RMSE    "R-sq"     F-Stat        P
------------------------------------------------------------------------------
mave           25      2    .0244159    0.8314   54.23707   0.0000
fave           25      2    .0286688    0.8013   44.36248   0.0000
------------------------------------------------------------------------------
             |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
mave         |
      Spring |     .04348   .0097742      4.448   0.000       .0237815    .0631786
       Trend |   .0063771   .0006772      9.417   0.000       .0050124    .0077419
    constant |   2.863306   .0112772    253.902   0.000       2.840579    2.886034
-------------+----------------------------------------------------------------
fave         |
      Spring |   .0386425   .0114767      3.367   0.002       .0155127    .0617722
       Trend |   .0069948   .0007951      8.797   0.000       .0053923    .0085973
    constant |   3.096549   .0132416    233.851   0.000       3.069862    3.123235
------------------------------------------------------------------------------

Correlation matrix of residuals:

            mave    fave
mave      1.0000
fave      0.5377  1.0000

Breusch-Pagan test of independence: chi2(1) =     7.228, Pr = 0.0072
```

Table 5. Graduate

Regressand: Mean grades
Regressors: Spring, Trend

```
  Source |       SS       df       MS                 Number of obs =      25
---------+------------------------------               F(  2,    22) =   62.03
   Model |  .032203141     2   .01610157               Prob > F      =  0.0000
Residual |  .005710764    22   .00025958               R-squared     =  0.8494
---------+------------------------------               Adj R-squared =  0.8357
   Total |  .037913905    24  .001579746               Root MSE      =  .01611

------------------------------------------------------------------------------
         |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  Spring |   .0096545   .0064498      1.497   0.149      -.0037215    .0230305
   Trend |    .004932   .0004469     11.037   0.000       .0040052    .0058587
constant |   3.650466   .0074416    490.550   0.000       3.635033    3.665899
------------------------------------------------------------------------------

Durbin-Watson d-statistic(  3,    25) =  2.375646
```

Table 11. Graduate

```
Seemingly Unrelated Regression
      Regressands: Mean grades of male students (mave)
                   Mean grades of female students (fave)
      Regressors: Spring, Trend


------------------------------------------------------------------------------
Equation      Obs  Parms        RMSE    "R-sq"     F-Stat        P
------------------------------------------------------------------------------
mave           25      2    .0284464    0.4205   7.982383   0.0011
fave           25      2    .0149051    0.9082   108.8291   0.0000
------------------------------------------------------------------------------
             |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
mave         |
      Spring |   .0022037   .0113877      0.194   0.847      -.0207467    .0251541
       Trend |   .0031487    .000789      3.991   0.000       .0015586    .0047387
    constant |   3.646069   .0131388    277.503   0.000        3.61959    3.672549
-------------+----------------------------------------------------------------
fave         |
      Spring |   .0157716   .0059668      2.643   0.011       .0037462    .0277969
       Trend |   .0060002   .0004134     14.515   0.000       .0051671    .0068334
    constant |   3.663038   .0068844    532.080   0.000       3.649164    3.676913
------------------------------------------------------------------------------

Correlation matrix of residuals:

            mave    fave
mave      1.0000
fave      0.0565  1.0000

Breusch-Pagan test of independence: chi2(1) =     0.080, Pr = 0.7777
```

Table 6. Writing Intensive

Regressand: Mean grades
Regressors: Spring, Trend

```
  Source |       SS       df       MS                 Number of obs =      23
---------+------------------------------               F(  2,    20) =   17.71
   Model |   .11941748     2   .05970874               Prob > F      =  0.0000
Residual |  .067432016    20  .003371601               R-squared     =  0.6391
---------+------------------------------               Adj R-squared =  0.6030
   Total |  .186849496    22  .008493159               Root MSE      =  .05807

------------------------------------------------------------------------------
         |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  Spring |   .0258459   .0242379      1.066   0.299      -.0247134    .0764053
   Trend |   .0106871   .0018253      5.855   0.000       .0068796    .0144945
constant |   2.826648   .0280404    100.806   0.000       2.768157    2.885139
------------------------------------------------------------------------------

Durbin-Watson d-statistic(  3,    23) =  1.207564
```

Table 12. Writing Intensive

```
Seemingly Unrelated Regression
      Regressands: Mean grades of male students (mave)
                   Mean grades of female students (fave)
      Regressors: Spring, Trend


------------------------------------------------------------------------------
Equation      Obs  Parms        RMSE    "R-sq"     F-Stat        P
------------------------------------------------------------------------------
mave           23      2    .0707622    0.5231   10.96713   0.0002
fave           23      2      .05124    0.7208    25.8157   0.0000
------------------------------------------------------------------------------
             |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
mave         |
      Spring |   .0275329   .0295378      0.932   0.357      -.0321653    .0872311
       Trend |   .0102093   .0022244      4.590   0.000       .0057136     .014705
    constant |   2.711765   .0341718     79.357   0.000       2.642702    2.780829
-------------+----------------------------------------------------------------
fave         |
      Spring |   .0253629   .0213888      1.186   0.243      -.0178654    .0685912
       Trend |   .0114151   .0016107      7.087   0.000       .0081597    .0146705
    constant |   2.920133   .0247443    118.012   0.000       2.870123    2.970143
------------------------------------------------------------------------------

Correlation matrix of residuals:

            mave    fave
mave      1.0000
fave      0.7840  1.0000

Breusch-Pagan test of independence: chi2(1) =    14.135, Pr = 0.0002
```